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CHEMICAL AGE

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USSR MINERAL TRADE

THIS year, the Soviet Government issued a 150-page 'Statistical Review of the USSR Foreign Trade in 1956' and based on this report Alexander Gakner in the Division of Foreign Activities of the US Bureau of Mines surveys Russia's foreign mineral trade.

That the number and quantities of mineral and metal commodities that the Sino-Soviet bloc of nations are increasing, cannot be denied. In addition to the traditional exports of manganese ore, chromite, gold-platinum group metals, asbestos and anthracite, the Soviet-bloc trades in about 35 additional mineral and metal commodities with the free world and in an even greater number within the Sino-Soviet bloc. The value of Soviet foreign-mineral trade in 1956 (exports plus imports) exceeded US $2 billion (at the rate of 4 Soviet roubles to US $1).

Although Soviet mineral commodity exports form only a small proportion of the free-world mineral needs, even relatively small Soviet shipments of platinum, aluminium, tin and zinc, injected at a lower price, are dislocating established free-world trade patterns. Non-Soviet mineral and metal trading companies have been and still are handicapped by the lack of information and figures on complete production and consumption, reserves of commercial mineral resources, plant capacities, or production costs, and also Soviet mineral exports and imports.

Since World War II the Soviet Union has intensified prospecting and exploration. It claims possession of commercial reserves of all mineral commodities. In addition, the USSR claims the world's largest explored reserves of iron ore (41 per cent of world total), manganese ore (88 per cent), copper, lead, zinc, nickel, bauxite, tungsten, mercury, mica, potash salts (54 per cent), coal (53 per cent), and significant resources of crude petroleum, natural gas, phosphate raw material (nearly one-third of world total explored resources), titanium, molybdenum, uranium, sulphur and numerous other minerals. There is, however, insufficient quantitative data on the individual commodities to support these claims, and indeed some statements are inconsistent with widely accepted views, as in the case of mercury and sulphur.

Minerals and metal products are playing an increasingly important rôle in the Soviet Union's foreign trade and as an instrument of foreign policy. Not only is the Soviet exporting precious metals, ferrous and ferro-alloy ores and metals, non-ferrous metals, non-metallics, solid and liquid fuels, etc., but technical competence as well, as in the case of construction plans for refineries and a pharmaceutical industry in India, fertiliser plants in Czechoslovakia, and plastics plants in Hungary.

Evidence is available that many of the Soviet mineral raw materials are inferior to those produced and/or consumed in the UK, the US and other European countries. Also, despite the claims of the Soviet, the mining and metallurgical industries of the USSR are said to be beset by low productivity and problems of raw-material supply and distribution, and transportation.

According to Gakner, by 1948 the Soviet Union had almost reached prewar production rates of mineral and metal commodities, and by 1949 had exceeded its 1940 production rates of iron ore, pig iron, steel, coal, coke, petroleum, natural gas and many other mineral commodities.

Under the master-plan, put into effect around 1948, joint mining companies

were organised between the Soviet Union and its satellites and in return for administrative and technical skill, equipment, etc., the USSR received a large share of the mineral output of the satellite countries. Commodities so acquired were frequently resold on world markets at several times the purchase price. Although nearly all the joint companies (except those mining uranium) have been dissolved, the USSR is believed to act as agent for its satellites in international trading.

With the increase in East-West tensions the Western allies, in 1948, decided to discontinue shipments of strategic commodities (such as minerals and metals) to the USSR. While this policy undoubtedly caused temporary setbacks, in the long run, the effect was to cause the Soviet Union to proceed at an increased pace towards higher production and hence to greater self-sufficiency. What could not be produced indigenously was acquired from its satellites. What could not be found within the Communist bloc was bought outside, despite the embargo; scientific research to find suitable substitutes was intensified.

It has proved difficult to form a clear picture of Soviet trade plans and motivations. The evidence today points to the use of Russian mineral-production potential as a formidable economic-political weapon through foreign trade. Various methods behind Russia's foreign mineral trade have been suggested such as: following the objectives in a stock-piling programme being met, the country now finds itself with a surplus production capacity of some minerals and metals; that as a result of a large exploration programme, the USSR found new mineral resources which it developed beyond its own normal domestic needs; that the country needs foreign exchange to purchase industrial equipment and is prepared to sacrifice its own domestic needs in mineral raw materials; and that recent economic reorganisation of the country resulted in a slowdown in the development rate of some mineral and metal industries, while other mineral industries did not experience a commensurate slowdown of development pace and are now out of step with the rest of the country's industrial development programme. Finally, it is thought that because the Soviet Union exports many commodities for which she herself depends on substantial imports from other Communist nations, it is possible that it is in the interest of the USSR to keep world prices for these commodities down, as free-world market prices also affect the price that the Soviet Union must pay to its satellites for the same commodities.

TRADE DEVELOPMENT

Several interesting features have been noted in regard to Soviet foreign-mineral trade development. From 1938 to 1956, the proportion of mineral imports to the total value of foreign trade dropped from 29 to 26 per cent and exports of mineral commodities increased from 13 to 31 per cent. Almost all the increase in the proportion of exports is due to the growth in ferrous and non-ferrous metal exports. Also, while nearly all the prewar mineral imports consisted of metals and metal products, these commodities constituted less than one-third (by value) of the Soviet mineral imports in 1956. Today the USSR is establishing itself (particularly in the Sino-Soviet bloc) as a manufacturing nation. Thus, in 1956, the Soviet Union imported about three times as much ore and concentrate by value as it exported, but in metals it exported twice as much by value as it imported.

Soviet trade statistics are difficult to find, but it has been estimated that approximately 70 per cent of the export trade in mineral commodities and probably more than 80 per cent of the import trade is with the Communist nations. In individual commodities, such as tin, zinc and chromium, the overall trends in trade can be seen. Within the free world, about three-quarters of the Soviet mineral trade is with European nations—the UK, Finland, France, West Germany, Italy, and Sweden (in that order). Within the Sino-Soviet bloc the principal mineral-trading nations are China, East Germany, Poland, and Czechoslovakia.

POSTWAR EXPORTS

Mineral-trade patterns of the USSR have been studied by Gakner. Prewar exports of petroleum and petroleum products reached a maximum of 5.2 million tons in 1931, when shipments of these commodities accounted for 14 per cent of the total value of Russian exports for that year. With her own needs to fulfill, shipments later declined. After the war Russia was a net importer until about 1950, when she initiated a large expansion programme of its domestic petroleum industry. From 1950 to 1956, domestic production of crude petroleum increased from 37.9 to 83.8 million metric tons and by the end of this period Russia was exporting over 10 million tons of crude and petroleum products (12 per cent of domestic output), about half going to the Communist nations. Of the remainder, 20 per cent went to Finland, 35 per cent to other European countries, and a similar percentage to African, Asian, and Latin-American countries.

Soviet exports of ores and concentrates have consisted almost entirely of iron ore, manganese ore (some of battery grade) and chromite. Imports into the Union have consisted primarily of bauxite, zinc, and lead ores and concentrates; and some ferro-alloy-metal concentrates. There are no details, however, on Soviet ore and concentrate imports from any of the European satellites. The USSR admits imports of tungsten and molybdenum concentrates from China, but no details have been published. No information exists on fissionable raw materials.

IMPORTS BY USSR

Non-ferrous metal trade of the USSR is again principally with the Communist nations. Much of the exports are re-exports (zinc, tin, antimony, cadmium). USSR imports of tin from China in 1,000's of tons are of interest, however, for in 1950 these were 3.8; in 1955, 16.9; in 1956, 15.7; and in 1957, 22.0. Also of interest are zinc imports from Poland. These were about 47,000 metric tons for each of the years 1955 and 1956. (Polish export statistics show zinc and zinc-alloy shipments to the USSR in 1,000 metric tons to be: 1953, 54.4; 1954, 50.5; 1955, 51.1; and 1956, 49.0.)

Russian statistics examined do not show the probable sizeable mercury imports from China, nor do they detail copper imports. The bulk of the Soviet Union's copper imports (almost all in the form of copper wire) can be traced to shipments from the UK (40,600 tons in 1956), West Germany (5,100 tons), Belgium-Luxembourg (3,300 tons) and Yugoslavia (1,500 tons).

The most important features of Soviet trade in non-metals noted by Gakner are the sizeable exports of asbestos, barite, mica, and apatite, both within and outside the Soviet-bloc. Soviet trade statistics even go so far as to distinguish shipments of crude apatite for metallurgical uses from apatite concentrate (used for manufacturing phosphate fertilisers). Of significance on the import side are Russian purchases of fluospar from China and Mongolia, sulphur (50,000 tons in 1956 and 72,900 tons in 1957 from China), talc (68,200 in 1956 and 70,800 tons in 1957 from China), and magnesite and piezo-quartz from China.

Many factors appear to favour a growing Soviet mineral trade. Thus, further rises in both imports and exports are expected as the country's economic plans call for further industrial expansion and development of its mineral resources.

Delivery Dates for UK Chemical Plant Discussed at BCPMA Annual Dinner

Delivery dates are sacrosant. Chemical exports can only be maintained on that basis . . . . Sir Miles Thomas

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To protect himself, the customer started to ask for earlier deliveries than he required . . . . H. W. Fender

DELIVERY dates on chemical plant were the subject of comment by the two main speakers at the annual dinner of the British Chemical Plant Manufacturers' Association, held at Grosvenor House, London, on 29 October. Mr. H. W. Fender (Prodorite Ltd.), chairman, presided over a company of about 725. Toast of 'The Guests' was proposed by Mr. Fender and replied to by Sir Miles Thomas, chairman, Monsanto Chemicals Ltd., and deputy chairman, British Productivity Council.

Sir Miles spoke first of the setbacks with the earlier Comet during his time as chairman of BOAC and how his signing of the contract for the Comet IV had been an act of faith. In the desperately competitive field of passenger aviation, particularly in trans-Atlantic service, a great many assumptions had to be made as a basis for every calculation; Sir Miles summarised these as an implicit faith that the aircraft would be delivered on the date promised and that its performance would not be one fraction less in any respect than was promised.

Delivery dates were not merely met; they were beaten, enabling BOAC to scoop the world and establish another 'first' for Britain and British aviation.

The manufacture of chemicals was perhaps not so glamorous as making jet aircraft, but it was even more vital to the national economy. Last year, the value of aircraft and engines sold in overseas markets was £116 million, and should exceed £150 million this year. The value of UK chemical exports last year was nearly £250 million.

Competition in Britain's chemical export markets was as fierce as anything to be found in any industry. They even had to contend with cut-throat rivalry from the Iron Curtain countries, which was something that had not yet been experienced in selling aircraft.

'Our major concern', declared Sir Miles, 'is to improve and expand our manufacturing plant, thereby further increasing our efficiency and giving ourselves more manoeuvring space in this eversharpening struggle for markets. To that end the British chemical industry has spent something over £600 million since the end of the war, and expenditure continues at a very high rate'.

That was why chemical producers did not underestimate the assistance they had had from BCPMA member-firms in achieving their present rate of production. Nevertheless, just as BOAC had to have Comet IV on schedule and to specification if the maxmium advantage was to be obtained from it, so it was with the chemical manufacturer who had ordered new plant.

'All his production estimates, his market assessments and his price calculations are based on the assumption that equipment ordered will be delivered on agreed dates and that it will work at planned efficiency with the minimum delay.'

Sir Miles said that he was born with a 'spanner in his mouth'. One of the first things he learned was that delivery dates were sacrosanct—that time of delivery of any piece of engineering equipment was an intrinsic element of quality, of workmanship. It was so in aviation and in the motor industry.

The same thing applied to chemical plant and Britain's export trade could only be maintained on that basis. It was for that reason that the chemical industry was relieved that delivery of plant had improved considerably over the last year.

But if delivery was harder, so were the times and it was hoped that the improvement was not due solely to a falling off in the demand for raw materials or to a lesser degree of pressure on fabricators. Chemical manufacturers hoped and believed that it was because plant manufacturers were making a genuine effort to speed up and stick to promised delivery dates.

Sir Miles also said 'we must remind you that after sales service is as important to us as price, quality and delivery time. We do our best to help you. As often as not, in addition to giving you detailed drawings for the equipment we are ordering, we supply further details of our requirements, such as degree of cleanliness, protective painting, method of protection against damage in transit, and so on. All we ask is that our instructions are passed on to those in the suppliers' workshops who would put them into effect'.

He then spoke of the combined efforts of the association and the Association of British Chemical Manufacturers to set up a trust fund for specialised chemical engineering research at the universities. If they could work together with such happy results in one field, he was sure they could do it in others; in fact, despite his grumbles, they were doing it every day.

Neither the chemical plant manufacturer nor the chemical producer could exist without the other; the prosperity of both was indissolubly linked. Chemical plant manufacturers would be faced with many challenges in the years ahead, but Sir Miles was sure that they would be met and beaten. All that was needed was a little of the Comet spirit.

Mr. Fender chose 'co-operation' for the theme of his remarks. On the question of delivery dates, he said that he was not really interested in post mortems, but that as BCPMA chairman he was very interested in both sides giving each other a square deal. Ever since the war an attitude of mind had developed throughout British industry which had led to delivery dates not being treated as sacred—there were always plenty of other people to blame.

As a result the customer, to protect himself, developed a habit of asking for earlier deliveries than he needed. In BCPMA they had seen both sides of that problem because a number of members were plant contractors as well as plant manufacturers.

Since the war the British chemical plant industry had done a splendid job of work, but it must and could do even better. Mr. Fender called for a return to a proper frame of mind, stating 'There must be trust in each other by customer and supplier. The customer must ask for the delivery he really needs; the supplier must offer only what he knows he can maintain. Do not forget also that there are many occasions when a difficult delivery date is stipulated because there has been a delay in finalising designs and I would ask that everybody gives great thought to this point'.

This problem was fundamental to British industry, but, nevertheless, both suppliers and users of chemical plant

should co-operate to solve it on a basis of mutual trust, without which they would not get very far.

Mr. Fender described the first-ever Chemical and Petroleum Engineering Exhibition held in June jointly with the Council of British Manufacturers of Petroleum Equipment as first-class; the exhibitors were to be congratulated for having put on such a fine show. The association greatly appreciated the attention that the technical Press devoted to it, and he rather regretted that some exhibitors neglected to take full advantage of the opportunity for publicity. Next time no doubt they would do rather better.

The symposium held by the Institution of Chemcial Engineers at the same time as the exhibition was an excellent example of the type of co-operation which should exist between a learned society and a trade organisation.

Mr. Fender described the arrangements made between the UK Atomic Energy Authority and BCPMA whereby the British chemical plant industry was to be placed in a position to carry out contracts overseas for certain chemical plants using technical information supplied by the AEA on a commercial basis as a sound approach. There was a need for more of it, particularly so far as concerned those overseas countries which wanted to develop their chemical industries.

They were going to obtain the 'know-how' from somewhere. 'Then,' said Mr. Fender, 'let them obtain British "know-how" and British plant. Let us in this way retain a long term continuing interest in these markets for the British chemical and chemical plant industries. Otherwise we might lose them altogether.'

Tribunal Hears Plea That Polymers Should be KID Listed

ON Monday, an arbitration began hearing complaints that certain polymers were improperly excluded from the Key Industry List J (a supplementary list of synthetic organic chemicals, etc.). The complainants—under section 1 (5) of the Safeguarding of Industries Act maintain that polythene, polymethyl methacrylate, polystyrene and p.v.c. are synthetic organic chemicals (which are already KID-listed) and have been improperly excluded from KID.

The Board of Trade's contention that the materials should not be listed because they do not come under that heading is supported by certain makers of polythene film and of p.v.c. sheeting.

Sir Lionel Heald, QC, with Mr. S. Gratwick, are appearing for the complainants; Mr. K. Johnston, QC, with Mr. R. Winn for the Board of Trade; and Mr. J. P. Graham, QC, with Mr. G. D. Everington for the opponents. The hearing is expected to last until Thursday. The referee, Mr. A. W. Roskill, QC, will publish his findings later.

Sir Lionel Heald opening the case for Bakelite Ltd., the Distillers Co. Ltd., Imperial Chemical Industries Ltd. and Monsanto Chemicals Ltd. described them as leading members of Association of British Chemical Manufacturers who are particularly interested in the manufacture of the polymers.

Sir Lionel stated that his case would primarily rest on the construction of an Act of Parliament. He did not think it necessary to become involved with too many technical details concerning polymers. The industry was regarded as essentially one which the Safeguarding of Industries Act was designed to deal with and it had never been able to understand the Board of Trade's attitude in excluding the chemicals concerned from the KID list.

This question became particularly important with the arrival of the new Import Duties Act which would be operative from 1 January next. It was generally understood that KID duties would be reimposed under the new Act.

The opponents' interest in the availability of cheap raw materials was understandable. He stressed that there was no ill-feeling of any kind with the opponents.

To establish his point that the polymers were chemicals, Sir Lionel instanced the case of polystyrene. The monomer styrene, a synthetic organic chemical within the Act, was subjected to a chemical process carried out in a chemical plant by chemical manufacturers to produce the polymer. It was obvious that polystyrene was itself also a synthetic organic chemical.

The process was one of heating and involved the use of a catalyst. 'When,' asked Sir Lionel, 'is a chemical not a chemical? The answer seems to be "When it is heated".'

He declared that it was agreed that polymers were 'synthetic' and 'organic' but not that they were chemicals.

£800,000 Dyestuffs Plant for Manchester

As part of a scheme to modernise the works at Clayton, Manchester, a plant costing £800,000 is to be built for the production of dyestuffs. It is due for completion by the middle of 1960 and will be engineered and constructed by Humphreys and Glasgow Ltd., of London, to utilise processes held by the Clayton Aniline Co. Ltd.

Decline in UK Output of Gas By-Products

UK crude tar production in the period April to June 1954, totalled 437,000 tons, 2 per cent below last year. Output of crude benzole at 6.1 million gall. was 3 per cent lower than in the previous year.

The amount of gas made from oil is still increasing, output rising from 1.8 million therms in April to June 1957 to 7.1 million therms in 1958.

A & W Agreement on Sale of Hetron Resins

AGREEMENT has been reached between Albright and Wilson (Mfg.) Ltd. and Hooker Chemical Corporation of US covering the manufacture and sale of Hetron resins, polyesters based on Het acid, also known as chlordenic acid. Patents are held by the US company covering the manufacture and use of polyesters based on Het acid and Albright and Wilson (Mfg.) now have rights under these patents for the whole of Western Europe, South Africa, Australia and New Zealand, including the right to sub-licence.

This is the first instance subsequent to closer public collaboration between the two companies since Albright and Wilson negotiated the exchange of its former American subsidiary for a substantial holding in Hooker Chemical Corporation.

Many applications for the use of Hetron resins have already been approved in the US and other applications include fume ducts, blowers and tanks in the chemical industry.

Full information is obtainable from the organic chemicals department of Albright and Wilson (Mfg.) at 1 Knightsbridge Green, London SW1.

Blaw-Knox Form New UK Contract Company

A NEW affiliated company, Blaw Knox Chemical Engineering Co. Ltd. with registered offices at 90-94 Brompton Road, London SW3 (Kensington 5161) has been formed by Blaw Knox Ltd. Owned jointly by Blaw Knox Ltd., of London, and their associates, Blaw-Knox Co., of Pittsburgh, Pa. US, the new company will design, engineer, procure and erect process plants as well as process equipment for the chemical and petroleum industries and serve and develop the UK and overseas markets.

Blaw-Knox, Pittsburgh, have recently completed the first UK synthetic rubber plant at Hythe, Southampton (see CHEMICAL AGE, 18 October, p. 641).

In addition to its own technical resources, the new affiliate will be able to draw upon the wide experience of the chemical plants and Buflovak equipment divisions of Blaw-Knox, Pittsburgh, whose chemical plants division has an extensive background in the design of plant for general industrial chemicals, resins and plastics, caustic and chlorine, petrochemicals, food processing, pharmaceuticals, fine chemicals, fats and oils, among others.

The Buflovak equipment division's products include evaporators, drying equipment, flakers, autoclaves and pressure vessels, and special designs of process equipment. The Blaw-Knox, Pittsburgh, research and testing laboratories will be available to Blaw Knox Chemical Engineering for customers' product research. Future plans call for a two-way exchange of ideas and reports on scientific and engineering developments.

Managing director of Blaw Knox Chemical Engineering will be Mr. John Woade (see 'People in the News', p. 767).

NOBEL PRIZE WINNER'S WORK ON INSULIN

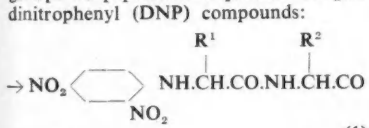
A Review of Dr. Sanger's Elucidation of the Structure of Insulin

BECAUSE of the biological importance of proteins, much time and effort has been devoted to them. But due to the large size and great complexity of protein molecules, progress has been slow. It is due to the work of Frederick Sanger that it is now possible to write the complete chemical formula of one protein and that protein is insulin. The hormone insulin is a protein of vital importance since it is used in the control of diabetes to regulate glucose metabolism.

Studies on the molecular weights of proteins have shown these to be large, generally lying between 5,000 and several million. In 1952, Harfenist and Craig, and, in 1955, Sanger, showed that insulin was one of the smallest having a molecular weight of 5,723, but that in aqueous solution, the molecule increases, so that the apparent particle weight is considerably greater.

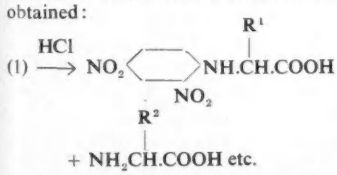
The fundamental components of proteins are amino acids, most having the general formula $R.CH(NH_2).COOH$. Twenty-one of these acids, with differences only in the R group occur commonly in most proteins. Insulin contains all of them except methionine, tryptophan, and cysteine. The amino acid residues are joined together in proteins by the formation of amide or peptide bonds between the α-carboxylic group of one residue and the α-amino group of another, thus forming long polypeptide chains. Hydrolysis breaks the peptide bonds, and a mixture of the component amino acids is obtained. The number of residues of each can then be determined. This procedure was used to write an empirical formula for insulin in terms of its amino acid content and then the arrangement of the amino acid residues in the molecule was found.

Sanger's initial work on the insulin molecule was to develop a general method for identifying and estimating N-terminal residues. FDNB (1-fluoro-2:4-dinitrobenzene) reacted with amino groups of peptides and proteins to give dinitrophenyl (DNP) compounds:



..... (1)

This new bond, on acid hydrolysis, is generally more stable than peptide bonds so that amino acids and the DNP derivative of the N-terminal residue are obtained:



DNP-amino acids (which are yellow) are isolated and identified by chromatography on silica gel columns or on filter paper.

Using this method, glycine and phenylalanine were found to occupy N-terminal positions in insulin, which suggested that there were at least two polypeptide chains in the molecule, one having an N-terminal glycine and the other an N-terminal phenylalanine residue.

Insulin was found to contain three residues of cysteine, which amino acid is capable of linking two polypeptide chains together through a disulphide bond. To break these disulphide cross-links, insulin was oxidised by means of performic acid, so converting one residue of cysteine to two residues of cysteic acid.

Dr. F. Sanger

Dr. Frederick Sanger, who was awarded the 1958 Nobel Prize for chemistry for his work on the structure of insulin

Nobel Prize Winner

It was then possible to isolate two fractions from insulin—an acidic one, having only N-terminal glycine (fraction A), and a basic one, having N-terminal phenylalanine (fraction B). Further work by Sanger and his co-workers indicated that each fraction was homogenous, that the A chain had 21 amino acid residues, out of which four were cysteic acid, and that the B chain had 30 residues, of which two were cysteic acid. Determination of the complete sequence of amino acids in the two chains was the next step.

The method used to elucidate the amino acid sequence of the A and B chains of insulin was to first partially hydrolyse the larger peptide to give a series of dipeptides the structure of which could be proved. From these the structure of the large peptide was deduced. The technical difficulty lay in isolating the peptides from a partial hydrolysate.

Fractionation of the peptides produced proved to be a major problem, but with the introduction of paper chromatography, fractionation of complex mixtures was possible. Better separations of the large peptides were obtained by electrophoresis on paper. Many sequences were deduced from the small peptides produced by partial acid hydrolysis although it was not possible to determine the complete sequence of the B chain. Thus, no peptide containing serine was found in which serine did not occupy the N-terminal position. This indicated that the peptide bond formed by the amino group of serine was very labile and so broken, thus making it impossible to determine which amino acid preceded serine. The large peptides produced by enzymic hydrolysis were therefore studied and in this way Sanger determine the structures of both the A and the B chains. In further investigations, the amide residues asparagine and glutamine (indicated by $-NH_2$ groups), after acid hydrolysis, broke down to ammonia and aspartic or glutamic acids respectively but during enzymic hydrolysis they remained intact and could be located.

The last problem facing Sanger was to find out which of the half cystine residues were joined together in the intact insulin molecule. The peptides containing cystine residues had therefore to be isolated and their structure determined.

Insulin was partially hydrolysed so that the disulphide bonds remained intact and the cystine peptides were separated from one another. The cysteine peptides were then oxidised to cysteic acid peptides which were identified from the amino acids produced on hydrolysis. The peptides structures and positions in the chains were known and from this the structure of the original cystine peptide and the position of the disulphide bond in the insulin molecule could be inferred.

Half-cysteine Residues

When the peptides were obtained from a partial acid hydrolysate, no unique structure could be determined and all the half-cysteine residues appeared to be linked with the half-cysteine residues which remained, suggesting that some rearrangement had taken place during hydrolysis, and that new cystine peptides formed.

It was discovered that the above reaction could be inhibited by the addition of small amounts of thiol compounds, and conditions suitable for the isolation of cystine peptides that were fragments of the original insulin, were found. Thus insulin was hydrolysed with acid without rearrangement of the disulphide bonds. The peptide mixture was then fractionated by electrophoresis on paper. The bonds formed were eluted and subjected to a second electrophoresis at a different pH. Ninhydrin reagent, which reacts with all peptides, and the use of a specific reagent for cystine peptides, gave the position of the peptides. Pure cystine peptide was thus

obtained which was oxidised to give two cystelc acid peptides A and B. Each was separated by electrophoresis and subjected to complete hydrolysis. From their amino acid compositions they were recognised as the peptides Ser.Val.Cy.SO_3H (positions A9-11) and Glu.Cy.SO_3H (positions A5-6) respectively. Therefore, the original cystine peptide was

Ser.Val.Cy
|
S
|
S
|
Glu.Cy

so establishing the disulphide link between the half-cystine residues in position A6 and A11. The peptides

Cy.Ala Cy.Ala
| |
S S
| and |
S S
| |
Leu.Cy His.Leu.Cy

established the position of the second disulphide bond joining positions A7 and B7 and

Tyr. Cy Cy.Asp.NH_2
| |
S S
| and |
S S
| |
Leu.Val.Cy Leu.Val.Cy.Gly

confirmed the A20 to B19.

Sanger's work has gone further than just the discovery of the structure of insulin. For example, he has examined the problem of determining the reasons for the activity of insulin and has also considered whether the whole of the insulin molecule is essential for the activity of the hormone or whether activity depends on an active centre composed of a limited number of amino acids residues. Studies of chemically modified insulins indicate that this last is the most likely, for while amino groups can be blocked without effect on activity, breaking of the disulphide bridges can result in loss of activity.

Examination of sheep, pig, horse and whale insulins by Sanger has shown that these only differ slightly from cattle insulin, the differences being limited to the position of the interchain cystine residue, thus:

Amino acid sequence in positions A7-10 of insulin from various animals

Cattle	$CySO_3H$.Ala.Ser.Val
Pig	$CySO_3H$.Thr.Ser.Ileu
Sheep	$CySO_3H$.Ala.Gly.Val
Horse	$CySO_3H$.Thr.Gly.Ileu
Whale	$CySO_3H$.Thr.Ser.Ileu

The rest of the A chain and the whole of the B chain are identical in all five species, suggesting that the exact structure of the residues in positions A8-11 is not important for biological activity.

In Sanger's view, a significant result of his work is that it demonstrates that insulin, and probably other proteins, are homogenous substances with their own structures. Determination of the structure of insulin brings it and other proteins within the field of organic chemistry and also points the way to similar investigations on the other biologically important proteins. Elucidation of the structure of insulin also brings into the realms of possibility synthesis of this important hormone.

REFERENCES

Harpenish, E. J., and Craig, L. G., *J. Amer. Chem. Soc.*, 1952, **74**, 3087.
Sanger, F., and Tuppy, H., *Biochem. J.*, 1951, **49**, 463.
Sanger, F., and Thompson, E. O. P., *ibid.*, 1953, **53**, 353.
Sanger, F., *Bull. Soc. Chim. Biol.*, 1955, **37**, 23.
Sanger, F., Thompson, E. O. P., and Kitai, R., *Biochem. J.*, 1955, **59**, 509.
Ryle, A. P., and Sanger, F., *ibid.*, 1955, **60**, 535.
Ryle, A. P., Sanger, F., Smith, L. F., and Kitai, R., *ibid.*, 1955, **60**, 541.
Brown, H., Sanger, F., and Kitai, R., *ibid.* 1955, **70**, 556.

New Chemical Finishes at Sheet Metal Show

ALBRIGHT AND WILSON'S stand at the annual exhibition of sheet metal working equipment in London on 5 and 6 November, featured many of the new metal finishing processes now available from the company. Considerable space was given to Phosbrite 159 for chemical polishing aluminium and its alloys. Also featured were Phosbrite 183 and 184, two solutions recently introduced for the polishing of copper and its single-phase alloys. Finishes of a high standard can now be achieved on brass, gilding metal, nickel silver, and beryllium copper by a simple process of immersion. Articles may be lacquered or plated after treatment.

Plusbrite, the latest process to be added to the A. and W. range of metal finishing products, was also discussed. This bright nickel plating process gives a fully bright deposit and was developed in the US by the Hansom Van Winkle Munning Corporation, under the trade names Nickelume and Levelume.

By Continuous Analysis New AutoAnalyzer Gives Quality Control During Production

ON-STREAM quality-controlled production is possible with the introduction of new equipment now being manufactured in this country under the trade-mark Technicon AutoAnalyzer by Technicon Instruments Co. Ltd., 26 Warwick Road, London SW5. This equipment, comprising a series of modules, variable in accordance with processing requirements, is used extensively in US industry, and the company is a subsidiary of Technicon International Ltd., New York.

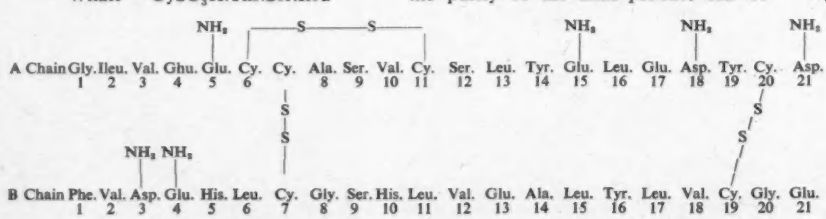
The AutoAnalyzer provides, through continuous chemical analysis, continuous control of product composition. Manual operations of the laboratory are reduced to automatic procedures, integrated into a continuous flow system in the plant, and results are permanently recorded in the direct language of the process itself —percentage of product composition. Plant control is achieved by fitting switches, slide-wires, or pneumatic pilots to the recorder, which can also feed digital computers, punched-card systems, etc.

Exact proportions of various components in a production process can, it is said, be held in perfect blend. Purity and quantity of constituents which affect the purity of the final product can be continuously controlled and consistency, appearance, taste and colour can be maintained. Once the standard of a product is set, the AutoAnalyzer will ensure that this standard is exactly reproduced throughout production. Several components can be monitored at the same time.

One of the most important features of the AutoAnalyzer is its ability to isolate constituents in process-streams, thereby affording quality control during production, not after. The system requires no manual attention.

The AutoAnalyzer is claimed to make accurate, complete water-analysis data immediately available on a continuous basis. Even trace elements, determined in parts per thousand million, can be handled with reproducible accuracy. The following advantages are claimed: water as a product ingredient can be continuously analysed; corrosion can be checked in piping systems, boilers, heat exchangers; deterioration can be reduced in cooling towers; steam generators can operate at higher levels.

Accurate and continuous analysis of condensate returns by the Auto-Analyzer monitors boiler-feed and automatically regulates water treatment.



Structure of Cattle Insulin

DSIR FUEL RESEARCH REPORT

Work on Air Pollution and Oil Synthesis to go to New Laboratory

ONLY two main items of research now being undertaken at the Fuel Research Station are to be transferred to new Warren Spring Laboratory at Stevenage. These are the programmes of work concerned with the measurement and abatement of air pollution and with the synthesis of oil from carbon monoxide and hydrogen, which are obtained from the gasification of coal.

Work on air pollution, states the Annual Report of the Fuel Research Board (*Fuel Research 1957*, the Annual Report of the Fuel Research Station, East Greenwich, is published for DSIR by HMSO, price 4s 6d (81 cents US), by post 4s 11d), will deal with the reduction of pollution from furnaces or other appliances, on the chemical reactions of pollutants in the atmosphere, and on dispersal and convective processes in the atmosphere.

Last year's report contained a note on the synthesis of oil from coal using the Fischer-Tropsch process and the work that is being carried out by industry under contract from the Ministry of Power to examine the economics of combining a new method of gasification with the best synthesis technique. Since the Ministry consider that the Station's research on the liquid-phase technique for synthesis is an essential part of this scheme, the board has recommended that this work should be continued at Stevenage up to pilot-plant scale. It is expected that occupation of the new laboratories at Stevenage should be started shortly and that these should be completed in spring 1959.

Development of Gas Producers

Gasification of coal and coke: To convert coal fines and dust to producer gas by partial combustion with air, or to water-gas by gasification with steam and oxygen, very high temperatures (of at least 1,500°C) are desirable to enable the reaction to be completed rapidly and so obtain a high plant output. Two types of gas producer operating at slagging temperatures with coal dust and air are being developed at the Station, both of which would be suitable for use with oxygen and steam to make synthesis gas. Since purification of synthesis gas from sulphur is important, attention is being directed to several methods of desulphurising gas either in the generator itself or in a separate high-temperature stage.

Investigations have continued with the slagging cyclone gas producer. The gasification chamber, 2 ft. in diameter and 2 ft. in depth, has been shown to be capable of gasifying 700 lb. of crushed coal (to 36-mesh BS test sieve size), but the quality of the gas produced has been inferior to that of normal producer gas, the calorific value never exceeding 70 B.Th.U./cu.ft. Use of re-entrant profiles for the central gas outlet at the base as a means of promoting secondary swirl patterns in the flow through the chamber is now being examined with a view to improving the quality of the gas.

An experimental unit has been set up at the station to investigate the possibility of gasifying bituminous coal dust. Exploratory trials are in progress to find how much dust can be added to the air blast without clogging the coke bed, and to find suitable refractory materials for the lining of the chamber to withstand the high temperature and contact with liquid slag.

Experiments to produce gas of low sulphur content have continued, using magnesia, iron oxide and zinc oxide. The desulphurising effects of magnesia and iron oxide have proved inferior to that of lime, but zinc oxide proved to be more effective than was expected from published free-energy data. Reduction of the iron oxide before use had no detectable effect on its desulphurising action.

Removing Organic Sulphur

Removal of organic sulphur compounds by these oxides appears to be unrelated to their efficacy in removing hydrogen sulphide, and it is suggested that it is probably associated with specific catalytic activity for conversion of organic sulphur compounds to hydrogen sulphide. Gasifying high-sulphur, low-ash petroleum coke with dry air at 930°C gave gas of an approximately constant sulphur content (90 grains organic sulphur, 90 grains H_2S/100 cu. ft.) obtained over a period corresponding to the consumption of 50 per cent of the carbon. This confirmed the view that when coke is gasified with dry air the sulphur is almost completely retained by the coke until most of the carbon has been gasified.

Synthesis of oil from coal: It is suggested that economic success should be possible under present-day conditions in the UK, if coal were converted into liquid and gaseous fuels, using a combination of gasification and Fischer-Tropsch synthesis. For the synthesis stage, the liquid-phase (slurry) technique is reported as showing the greatest promise. The main lines of work comprise the development of cheap but active and durable catalysts for the synthesis reaction and the solution of the chemical engineering problems peculiar to the liquid-phase technique.

Further work has been done on promotors for mill-scale catalysts and it is reported that potassium acetate (2 parts K_2O/100 parts Fe by weight) was more effective as a promoter than potassium carbonate or potassium borate. Addition of free acetic acid (2 parts/100 Fe) to the potassium acetate solution used for impregnation improved the activity and decreased the proportion of methane in the products. Combination of copper acetate, potassium acetate and acetic acid (5 Cu, 2 K_2O, 2 AcOH/100 Fe), however, gave the maximum activity observed with catalysts of this type when used without prior reduction.

Collaboration with a British catalyst manufacturing company has continued on the development of inexpensive precipitated iron catalysts suitable for operation in a slurry system. Trial batches of catalyst are being employed in exploratory pilot-plant experiments.

A high proportion of sulphate has been found to decrease catalyst activity, but has a favourable effect in suppressing formation of methane. The presence of copper, while having little effect on activity, increases the induction period necessary for the attainment of maximum activity.

The effect of the ratio of ferric to ferrous iron in these catalysts is also being studied. Conversion of all the iron to red α-Fe_2O_3 was found to lower catalytic activity only slightly, but if the iron was converted to black α-Fe_2O_3, a marked reduction in activity was noted. The life of the catalyst was found to be markedly dependent on the ratio H_2/CO in the synthesis gas, deterioration being particularly rapid when the ratio is as low as 0.6 to 0.7.

Liquid-phase (Slurry) Process

Problems now being studied on the liquid-phase (slurry) process in a pilot-scale reactor (diameter 10 in., height 23 ft.) which holds a charge of 150 l. of slurry, are the physics of the distribution of gas and catalyst particles throughout the liquid, the separation of non-volatile products of reaction from the catalyst and the effects of size and geometry of the reactor. The first synthesis run was with a charge of liquid paraffin, and a precipitated catalyst of rather low activity. The run, mainly free of mechanical troubles, lasted three months. In subsequent runs, using more active catalysts in a medium of synthetic wax, initial results were promising but mechanical difficulties were experienced, e.g. inadequate filtration rate, frothing of slurry and disintegration of the catalyst.

Germanium in coal: Tests made on a setting of continuous vertical retorts at a North Thames Gas Board works have given results indicating that the normal day-to-day variations in the operating conditions have an important influence on the proportion of the total germanium driven off from the fuel bed. In three tests, the sums of fractions

retained in unburnt coke, clinker and ashes were 26, 15 and 34 per cent of the germanium originally present in the coke. Where there was no disturbance of the material deposited in the flues, between 50 and 60 per cent of the total germanium was present in the gas entering the chimney. Only about 10 to 15 per cent of the total germanium is contained in the type of flue-deposit which is left undisturbed for long periods. The work has produced further evidence in support of the belief that germanium is present in the flue gas largely as an aerosol.

The possibility of collecting particulate material containing germanium on a commercial scale presents considerable difficulty, the report states, in view of the very small size of the particles and the low concentration (about 0.01 grain/cu. ft.) in the chimney gas.

Removing sulphur from flue gases: Two lines of enquiry are being followed to see whether a new and less costly process of wider applicability can be developed. The first concerns the possibility of absorbing the oxides of sulphur in a suspension of manganese dioxide in water to give manganese sulphate and sulphuric acid and then to regenerate the manganese dioxide for further use by electrolysis, which also produces more sulphuric acid. The second is an investigation of solid absorbents for the oxides of sulphur which could be used at the temperature at which the flue gas leaves the boiler.

Scrubbing of Flue Gas

More experiments have been carried out on the use of suspensions of manganese dioxide for scrubbing flue gas. As long as the concentration of manganese dioxide in suspension was kept above 0.5 g./100 ml., 98 to 99 per cent absorption of sulphur dioxide was maintained over a period. An efficiency of 96 per cent was obtained when starting with 40 per cent sulphuric acid containing about 20 per cent manganese dioxide in suspension.

With regard to the electrolysis of the solution of sulphuric acid and manganese sulphate to regenerate manganese dioxide, conditions have not yet been found under which all the manganese sulphate can be decomposed in this way economically.

Work has been started to determine whether a process can be developed on the basis of the absorption of sulphur dioxide by a metallic oxide at the temperature at which the flue gas leaves the boiler, the sulphate formed in this way being roasted to regenerate the oxide. Oxides of manganese have been tried and although the efficiency of sulphur dioxide is good, the weight absorbed is small in relation to the weight of oxide present. This is presumed to be due to the reaction being restricted to the surface layers.

Corrosion and formation of SO_3: Following encouraging results obtained on a laboratory scale, large-scale tests have been carried out to see whether the injection of small amounts of reducing gases such as water-gas or producer gas into boiler systems would reduce formation of sulphur trioxide. Using flue gas no significant reduction of sulphur trioxide was observed and it was concluded that even a large excess of reducing gases would not be effective in reducing the proportion of sulphur trioxide in the flue gas.

The effect of additives on neutralising sulphur trioxide in the flue gas in oil-fired boilers has been investigated using an instrument developed at the station. Significant reduction in the proportion of sulphur trioxide in the flue gases was recorded, following the addition of very finely powdered dolomite, varying from 1 to 12 parts per 1,000 parts of fuel oil. The effects of adding both dolomite (up to 3.5 parts per 1,000 parts of oil) and ammonia have been studied. Dolomite was injected into the combustion chamber and produced a small but significant lowering of the dewpoint and a slight reduction in sulphur trioxide content of the flue gas. The addition of ammonia was strikingly effective in completely suppressing the acid dewpoint but corrosion was only reduced by about 50 per cent (probably due to the deposition of acid ammonium sulphate).

New Power-Gas Work on Plant for Rocket Research Stations

STAINLESS steel spheres and flame deflectors for erection at one of the new rocket research establishments are now being assembled and fabricated by the works division of the Power-Gas Corporation Ltd., Stockton-on-Tees. The spheres are fabricated from material 2¾ in. thick. The largest deflectors are 18 ft. 6 in. square, fabricated in mild steel, water-cooled with 90° bends for the purpose of deflecting the exhaust gases from the vertical to the horizontal plane. These items are being fabricated for British Oxygen Wimpey to the instructions of the chief engineer, M.o.W.

Two Power-Gas/Hercules hydrogen plants, at Purfleet and Laporte Chemicals, have satisfactorily passed the guarantee test. The unit at Purfleet, where hydrogen is used for hydrogenation of whale oil, is the first of its type in the UK to operate on a five-day week basis. The unit for Laporte Chemicals, with three stages of conversion and final methanation, provides a very high purity product with a minimum of carbon monoxide and residual methane.

A Power-Gas/Hercules plant for Kali-Chemie AG, Hanover, should be in operation by summer 1959. The latest order for a Power-Gas/Hercules reforming furnace is for a four-tube unit for the UK.

The division's extensions to the ammonia synthesis gas plant for ICI Billingham Division have now been completed and the sequence of start-up operations has started. This project includes a Benson and Field hot carbonate carbon dioxide removal plant which the Power-Gas Corporation have designed, engineered and supplied.

In the sulphuric acid field, the company has recently received an order from British Chrome and Chemicals for the installation of a 100 ton per day contact unit from sulphur. Erection is expected to start shortly. A further order has been placed for a contact plant in connection with a coke-oven gas desulphurisation scheme and this unit is to make sulphuric acid from the sulphur dioxide obtained by the gas purification process. Work on this contract is at the drawing office stage.

The petroleum plant division is now engineering and constructing three process units for the BP Refinery, Grangemouth. Scheduled completion date for the contract, which comprises a copper chloride unit, a kerosene raffinate soda washery and a de-ethaniser unit, is 31 December 1958.

The gas plant division is working on a 2-million cu. ft. per day Segas oil gas plant for the Northern Gas Board at Darlington. Winterthur, Switzerland, have ordered a 6-million cu. ft. per day Segas plant. The Segas plant now being built at Rostock in East Germany is to be extended; there will be two units, each having a daily capacity of 30,000 m^3.

Rosedowns reported that the rotary continuous solvent extraction plant (Merz system) for the Pyrethrum Board of Kenya has been completed and shipped to Nakuru where it will process pyrethrum flowers.

The company is currently installing a high-temperature heating plant operating on the Bertrams/Rosedowns system using Dowtherm in the vapour phase to produce 1,600,000 B.T.U's per hour in a Rosedowns semi-continuous vegetable oil deodorising installation. An electrically heated liquid phase unit of 45 kW will shortly be put into operation for process heating in the pharmaceuticals industry.

Standard-Vacuum Refining Co. (Australia) have recently placed an order for the supply and erection of an elemental sulphur recovery plant at their Altona Refinery, Victoria. Design will be carried out in association with Comprimo NV, under licence to NV de Bataafsche Petroleum Maatschappij. Using H_2S refinery gas as feedstock, the plant will recover 40 tons per day of sulphur. The process is a modification of the Claus-two-stage catalytic type, but will embody features to give maximum recovery (greater than 95 per cent) of all sulphur and to reduce maintenance. The third stage catalytic after combustion of H_2S and SO_2 will give an effluent gas with an H_2S content of less than 5 p.p.m. The plant is scheduled to begin production in mid-1959.

LATEST FCL FERTILISER WORKS USES HOT GRANULATION PROCESS WITH VISUAL CONTROL

ON the Trent-side site at Misterton, Gainsborough, where Morris Brothers first manufactured sulphuric acid and superphosphate, in 1874. The Farmers' Co. Ltd. (FCL) have set up a £¼ million factory (the Stockwith Works) for the manufacture of 30,000 tons a year of granulated concentrated compound fertilisers.

FCL, who first commenced the manufacture of fertilisers on several acres of land at Barton and at Brigg in 1874, acquired the 12½ acres of land at Misterton from the British Transport Commission in 1956. Site clearance began in January 1957 and the factory has just been completed. The factory area covers 6 acres, and the factory has a floor area of 50,000 ft. Storage capacity for raw materials is 4,000 tons and for finished products, 7,000 tons. Rate of intake of raw materials into the plant is 50 tons per hour and capacity of the bagging plant is 25 tons per hour. The 30,000 tons' production capacity labour requirement is about 40 men.

For the production of concentrated and other fertilisers the company has developed a new process, whereby it is now possible to manufacture granulated concentrated mixed fertilisers containing at the same time plant food ratios of over 25 nitrogen (N) to 1 phosphorus (P) and 2.5 potassium (K) to 1 phosphorus (P). On this basis fertilisers containing up to 50 plant food units have been produced.

Visual Control

As the process is a hot granulation one, control is visual. Another feature of the new method is that dihydrate process phosphoric acid can be advantageously used as produced at the acid plant filters. It is also stated that the sulphuric acid normally present in technical phosphoric acid is at times sufficient for the needs of the granulation process.

Phosphate weighing and feeding is controlled electronically at the Stockwith Works. The weighing machines are of the even-arm beam type, and the electronic weigher discharge trip is released by a solenoid energised periodically by a two-internal electronic timer unit. The alternating current in the timer is rectified and regulated and the controlled d.c. voltage led to the first internal timing valve through a potentiometer. The accuracy of weighing is reported to be ±¼ per cent with tripping periods of 40 seconds or over.

The weighed hatch is smoothed into a continuous flow by an electronically controlled conveyor. The d.c. motor is directly coupled to a tachometer generator which feeds back a voltage to the control unit that prevents unselected changes in the conveyor speed.

Raw materials storage hoppers are filled from an overhead grab, except for the process fines which are returned from the plant by a spiral conveyor. The bottoms of the hoppers are comprised of rubber conveyor belts, press-button controlled by a weighman. The conveyor belts discharge the material into the receiving hopper of a dial weighing machine.

When the complete batch is weighed off, electro-hydraulically operated discharge gates are opened, and the fertiliser conveyed to the granulating plant where it is pulverised, mixed and made to flow continuously.

Phosphoric acid is manufactured using the company's own dihydrate process. In 1953, to enable FCL to manufacture triple superphosphate for use in concentrated compound fertilisers, a phosphoric acid plant was installed at Barton-on-Humber. The essence of the process is to obtain good-size crystals of calcium sulphate (dihydrate) for the better filtration of the phosphoric acid/dihydrate sludge obtained.

Temperature of the sludge is stated to be important because of its effect on speed of filtration, and on the filter cloth itself (multifilament Terylene yarn with a tight twist has been found to produce the best filter cloth).

Much care has been taken by FCL in the treatment of gaseous effluents from the phosphoric acid plant and the fertiliser granulation plant and of liquid effluent from the latter plant.

The considerable volume of contaminated steam released from the phosphoric acid plant when the submerged flame evaporator is operated is first treated in a cyclone irrigated with weak phosphoric acid to remove entrained acid droplets, and in a second cyclone the gases are irrigated with water to remove compounds of fluorine and sulphur. At the second stage the gas temperature is reduced to below 40°C.

Hot air and gases from the dryer and the air cooler of the fertiliser granulation plant are separately treated in cyclones for the removal of the dust burden. Two dust-settling chambers follow in the system. These serve chiefly as a safeguard against cyclone failure.

The gases are then washed with water, again in separate towers, retention times being of the order of 10 seconds for the cooler gases and 20 seconds for the dryer gases. Sludge settling bases to these towers allow for the collection of sludge formed at times by small size dust. The water used is of the order of 10 gallons per 1,000 cu. ft. gas.

The two streams of gases are then mixed in a brick chamber which acts first as a condenser, before water droplets are removed by vertical collection boards. The velocity of the gases in the chamber is about 5 ft. per second. The treated gases then pass to a high chimney.

Cutting across the air system just des-

(*Continued on page* 760)

3- and 4-Methyl Piperidine Now Available from Robinson Brothers

NOW available in experimental quantities from Robinson Brothers Ltd., West Bromwich, are 3-methyl piperidine and 4-methyl piperidine, both of which are of interest in chemical synthesis where modified properties of the piperidine molecule are desired. Summarised below are their main physical and chemical properties.

	3-Methyl piperidine	4-Methyl piperidine
Alternative names ...	3-pipecoline β-pipecoline	4-pipecoline γ-pipecoline
Mol. wt.	99.11	99.11
Description	Colourless and odour similar to piperidine	Colourless and odour similar to piperidine
B.p.	123-124°C/748 mm.	90 per cent at 123-125°C/751 mm.
Sp. gr. at 20°C	0.8469	0.8421
R.I. at 20°C	1.4479	1.4461
Flash point	46°F	48°F
Solubility	Miscible with most organic solvents and solubility in water decreases with rise in temperature. Miscible with water in all proportions below 56°C Behaves as an aliphatic secondary amine but more reactive than 2-methyl piperidine but less reactive than piperidine.	Miscible with most organic solvents and solubility in water decreases with rise in temperature. Miscible with water in all proportions below 85°C Behaves as an aliphatic secondary amine and forms normal derivatives
Salt formation		
Hydrochloride m.p.	171-172°C	189-190°C
Platinichloride m.p.	207°C (decomp.)	203°C (decomp.)
Aurichloride m.p. ...	130-131°C	125-127°C
Picrate m.p.	136-138°C	129.5-130°C
Benzoyl derivative		
m.p.	44-45°C	83.5-84°C
b.p.	185-186°C/13 mm.	—
Alkylation	By normal methods	By various means
Dehydrogenation by heating benzene solution under pressure for 5 hr. at 350°C with a nickel-on-nickel chromite catalyst	53 per cent yield of 3-picoline	To 4-picoline
Reaction with one molecule of carbon disulphide	2 mols to form 3-methyl piperidinium 3-methyl cyclopentamethylene dithiocarbamate	2 mols to form 4-methyl cyclopentamethylene 4-methyl piperidinium dithiocarbamate

★ ADVICE given to speakers in CHEMICAL AGE in 1957 (7 April, p. 785) has been described as 'particularly good' by Mr. E. C. S. Little, M.Sc., at present working at Oxford for his D.Phil. before returning to New Zealand. Mr. Little makes this acknowledgment in 'Agricultural conferences: their planning, organisation and management', a paper accepted by the Council of the New Zealand Institute of Agricultural Science and published in *New Zealand Science Review*.

Mr. Little adds to the list of faults of many speakers which were pinpointed by CA. The combined list is a formidable indictment, but fortunately it is extremely unlikely that any one speaker would ever be guilty of them all; many are guilty of one or more.

Here is a brief summary of them. Presentation in a dull and soporific manner; hands immobilised in pockets; audience never looked at; paper read verbatim and fast, inducing slumber because arguments cannot be followed; quick flashing of graphs on the screen with no time to assimilate them; reading from script in a monotone and changing to conversational tone abruptly to comment on slides; bad microphone technique, with some words boomed into it and others spoken far away from it; fidgetting with pointer, chalk, or papers; nervousness, which a restless audience magnifies.

This list is far from exhaustive; there is some hope, however, for those of us who err as public speakers. Advance reading of a paper to colleagues can be of great help while the prior distribution of papers enables the audience to follow the author's arguments.

★ DEVELOPMENT and testing of a device that will remove carbon monoxide from exhaust gases of road vehicles is reported on in 'Fuel Research 1957' (HM Stationery Office 4s 6d), the annual report of the DSIR Fuel Research Station. The device, said to be capable of removing up to 85 per cent of the carbon monoxide and 80 per cent of the hydrogen in an exhaust under all conditions of operation of the engine, comprises a catalyst which is mounted in the exhaust pipe.

The report states that the device under test showed some signs of decreasing efficiency after use for 11,000 miles. I was interested to learn from the station that the catalyst concerned is platinum alloy on a ceramic base (pipe clay).

★ PRODUCERS of leather soles, who represent the section of the tanning industry to be hardest-hit by competition from other materials, are now to be faced with competition in the publicity sphere as well. For many years a strong publicity campaign for leather has rankled with producers of other materials who have relied on counter-publicity by individual firms.

Now the Man-Made Soling Association Ltd. has been formed to promote the interests of and extend the UK industry engaged in the production and sale of footwear made from or incorporating rubber, plastics or similar materials.

Subscribers are: Avon India Rubber; Dunlop Footwear; Goodyear Tyre and Rubber Co. (Gt. Britain); J. H. C. Roberts, ICI Plastics Division; Monsanto Chemicals; Polymer (United Kingdom); and the Sussex Rubber Co. Registered office is at Premier House, 48 Dover Street, London W1.

★ THE free trade area proposals have combined with the common market to bring to the fore the need for an international appreciation of standards of quality and the use of quality procedures. This need has been met by the European Productivity Agency setting up the new European Organisation for Quality Control, with headquarters in Rotterdam. The British Productivity Council has been appointed to represent the UK on the management of the new organisation.

Membership, which is open to firms, trade associations and to professional institutions, universities and technical colleges will confirm the right to receive information on all projects (the first of which will deal with sampling procedures); to receive copies of a quarterly bulletin which will report developments on quality control techniques; participation in a question and answer service.

Full details may be obtained from the BPC at 21 Tothill Street, London SW1.

★ THE first US plant to employ the Chemico urea process came on stream recently. The plant is the latest addition to the large fertiliser installation which Chemico designed for Lion Oil Co., Eldorado, Arkansas, a company that has since 1952-53 merged with Monsanto Chemical Co.

Although this is the first such urea plant in the US, other plants are in operation elsewhere and when all the Chemico urea plants now under construction are completed, this process will, I am told, account for a greater percentage of the world's total production of urea than any other commercially available process.

The system is available in this country and overseas from Chemical Construction (GB) Ltd., of Henrietta Place, London W1.

★ THE ORDERING of a 50-ton sulphuric acid plant of Chemiebau design by Travancore Rayons, Permbavoor, India, will make an unusual concentration of Chemiebau sulphuric plants. Within 20 miles, a 160-ton unit is nearly completed and within 120 miles a further 50-ton unit is being supplied by the Power-Gas Corporation.

This news comes from the latest edition of *Power-Gas Group Review*, the group's magazine. From this I also learn that the company's general contracts division has 'satisfactorily completed work on the installation of a new synthetic rubber factory at Leyland.'

★ AN effective way of safeguarding relatively fragile glassware in transit from warehouse to customer is claimed to have been found by Q.V.F. Ltd., Fenton, Stoke-on-Trent. 'Glass with care' and similar cautionary labels, they say, are commonly disregarded, sometimes with disastrous results. The best safeguard is to let the goods handler see what is inside the packing case.

The advantage of the 'visible package' is conspicuous when glassware and the like is exported and more than 40 per cent of Q.V.F's glassware is produced for export.

The packing case newly designed at Fenton after several experimental 'visible' cases had been tried out and improved on, is shown on p. 764, with a 6-inch borosilicate glass condenser made ready for packing. The condenser contains 70 ft. of glass tubing, weighs 22 lb. and is about 3 ft. high.

The half-windows on three sides of the case are of robust expanded metal. Overall dimensions are 44 in. by 20 in. by 20 in., and the packed weight of the improved case is only 83 lb., compared with its predecessor's 133 lb.

I am glad to hear that since the new packing was perfected no breakages have occurred.

★ WHAT are the best years of a chemist's life? According to an American, Mr. H. C. Lehman, the peak years of scientific achievement are from 30 to 34. Doubtless Mr. Lehman has started a controversy that will continue in research laboratories for some time if only because most of us, apart from those of very advanced years, are firmly convinced that the best years of our lives are yet to come. At any rate I have no doubt most of my readers will be able to think of notable exceptions to Mr. Lehman's finding, many of which come readily to mind.

This finding is said to have come after a long period of research into the biographies and achievements of 2,500 of the world's leading chemists.

Alembic

ECONOMICS OF CHEMICAL ENGINEERING

Estimating Manufacturing Costs for Project Evaluation

AS many as 100 economic studies might be needed in the chemical industry before a project could be found on which full-scale development work was justified. That was the warning given by J. E. Cran of Distillers Co. Ltd., in his paper read at the symposium on Chemical Engineering Economics organised by the Graduates and Students Section, Institution of Chemical Engineers on 23 and 24 October (see also last week's CHEMICAL AGE, p. 725). In the early stages of evaluation unnecessary detail must be dispensed with and a standard procedure was recommended, with quantities clearly defined and understood by engineer and executive.

Flow-sheet considerations made a good basis for capital estimate because from the flow-sheet, the size and quantity of each item of equipment and materials could be determined. The usual method was to multiply total equipment cost by a factor based on analyses of plant costs.

Utilities requirements should be calculated from materials and energy balances around each item, so that steam and water requirements could be estimated. Ten per cent of theoretical was usually adequate against loss of heat by radiation. One important point stressed by Cran was that the work done by pumps on the fluid would be much less than the shaft horse power and that another efficiency figure would be required to calculate the actual power consumption of the electric motor.

Three Types of Labour

Labour requirements: Three kinds of labour were necessary, direct process, day shift (yard gang) and supervision. Elaborate analyses of labour requirements were difficult initially but once a flow sheet had been drawn up it should be divided into stages and the labour assessed from it. Difficult or critical stages, such as reactors or batch operations should be allowed one man full time while recovery operations should have ¼ to ½ man per unit. For continuous operation, labour requirements should be multiplied by four to allow for time off.

More detailed assessments of labour would entail drawing up a series of schedules from the flow-sheet. Under each stage would be written every duty to be performed and to each would be allocated an appropriate unit of time, with a generous allowance for spare time and contingencies. Divide the sum in hours by eight to determine the number of men required per stage.

Maintenance: Estimations for maintenance were usually estimated as from 2½ to 10 per cent of the total capital, but variations must be considerable, e.g., handling of corrosive materials was likely to be more costly, but past experience and judgment must be relied on to a great extent.

Included in works overheads were charges directly related to labour, such as national insurance, provision of protective clothing, etc., and these could be added to costs of direct labour.

Rough approximation of total overheads could be made by multiplying labour and supervision costs by a factor or by rating overheads as a percentage of gross returns or operating cost.

Where the price of raw materials is not known a graph could be drawn of selling price or production cost versus probable prices of raw materials. Two or more unknowns could then be handled using one as abscissa and the others as parameters.

Considerable discount should be allowed for the disposal of by-products as the success of the process might depend on this, and it was better than capitalising further plants for purification of the by-products. When two or more streams of roughly equal value were produced, the simplest method was to cost the main one and treat the other as a credit item.

The size of the profit was not the only criterion by which a project might be evaluated; retention of a traditional business or entry into a new field were two other possible motives. Return on capital could be calculated by deducting operating cost from selling price and expressing this as a percentage of capital, but Mr. Cran's advice to engineers was to repudiate all responsibility for assessing a selling price. If 15 per cent was accepted as a reasonable net return on the investment, gross return (before tax) would be about 26 per cent. The return on capital would then be calculated as 26 per cent of the total fixed and working capital.

Mr. Cran went on to discuss the computation of tax and depreciation and calculated that by depreciation (taxwise) and sale of scrap the original sum of money would be recoverable in nine years.

Cost Figures for Storage Tanks and Process Equipment

COST figures were put foward both graphically and as a price order for various classes of storage tanks, process vessels, heat exchangers and distillation equipment, by B. Pollard, E. V. Wood and J. Carter (Constructors John Brown Ltd., London W2). It was pointed out that it was hazardous to put forward in public cost estimates for equipment but the figures indicated by the authors represented an average for the UK fabricating industry. The relative costs for mild steel, aluminium and stainless steel could be estimated using factors 1.0, 2.0 to 2.5, and 2.5 to 3.0 respectively.

In the case of heat exchangers, costs based on 1 inch per cent tubes varied with the type, operating pressure, etc. Thus for a simple low pressure fixed tube plate type up to 50 p.s.i.g. wkg. the price per square foot varied from 13s. for the large ones to 100s. or more for small ones. Tube length had an effect on the cost per square foot for a given surface area as follows: taking 16 ft. length the factor of 1; 8 ft. length the factor of 1.15; 4 ft. length the factor of 1.4. Price of TEMA type heat exchangers 150 p.s.i.g. varied from 28s. to 120s. per sq. ft. and higher, based on a floating head type whereas fixed tube plate types would be 10 to 20 per cent cheaper. The effect of varying tube length was stated to have a greater effect on the cost per square foot: 16 ft. length factor 1.0; 8 ft. length factor 1.5; and 4 ft. length, factor 2.5. In a consideration of relative costs all mild steel material required a factor of 1, stainless steel on one side, a factor of 2 for large sizes and 2.5 for small sizes; and all stainless steel, a factor of 3.0 to 3.5. The price per square foot was higher for ¼ inch

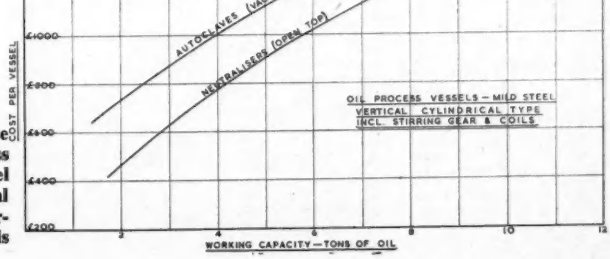


Fig. 1. Cost curve for oil process vessels—mild steel vertical cylindrical type including stirring gear and coils

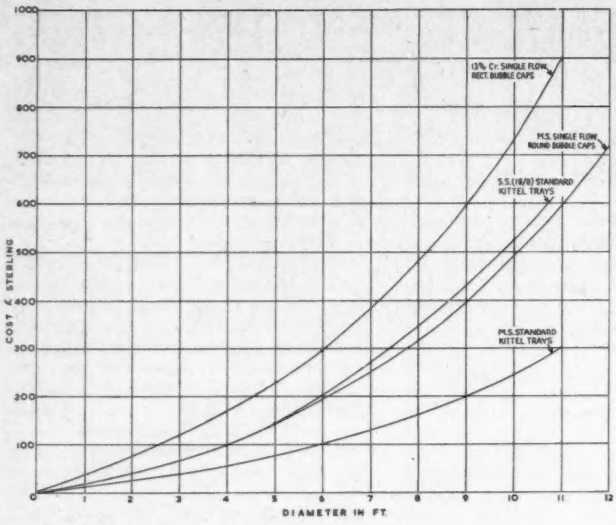


Fig. 2. Curves showing actual costs of bubble caps in terms of column diameter for mild steel and 13 per cent chrome steel (18/8 steel × 20 per cent) and on the same basis of the Kittle plate

o.d. tubes (about 2 per cent).

Pollard *et al.* stated that it was almost impossible to give comprehensive cost data on distillation columns owing to the very large number of different types of plates which are now being used.

Where packed columns were employed the question of cost was simply one of simple multiplication of the basic cost of the ring pack times the number required. Approximate prices suggested were:

Porcelain rings: 2 in. 15s/cu. ft.; 1½ in. 18s/cu. ft.; 1 in. 25s/cu. ft.; and ½ in. 67s/cu. ft. If these figures were taken as a base of 1 the factor for mild steel was 2 and for stainless steel about 10.

Curves were presented (see Figure 2) showing actual costs of bubble caps and Kittle trays. To make direct comparisons of cost for a given duty, the specific throughput of each type of plant had to be considered. Costs of the new types of plate with high specific throughput reduced the cost even further than was indicated on the graph.

TABLE I
Suggested Fabrication Cast

Vessels		Mild steel Per ton	Stainless steel Per ton	Aluminium Per ton
Atmospheric Storage Tanks				
Rectangular	(large)	£130		
	(small)	£180		
Cylindrical			£750—£1,500	£650—£1,400
	(large)	£180		
	(small)	£300		
Pressure vessels			£900—£1,750	£850—£1,700
	(large)	£200		
	(small)	£400		
Process vessels		£240—£450	£1,000—£2,200	£950—£2,200

FCL's New Fertiliser Works

(*Continued from page 757*)

cribed is the wash system. The water and the condensate from that system is filtered and neutralised in a duplicated bed of graded limestone. At this stage the used washed water of pH 3.0 is neutralised to a value of pH 6.5, and passed into storage in a duplicated storage system for further use.

When the dissolved solids content of the water becomes too high for effective washing, it is used as granulating process water whenever possible, or failing which, pumped to waste after cooling to or below the maximum permissible temperature.

CONTRACTORS AND SUPPLIERS

Among contractors and suppliers to the FCL stock with works were: (Plant equipment): W. and A. E. Brearley (Machinery) Ltd., disintegrator; Codd and Drewry, gas cleansing chambers and chimney; Fishers Ltd., bagging plant; Hepburn Conveyors and Co. Ltd., proportioning plant, elevators, conveyors, etc.; Manlove, Alliott Co. Ltd., rotary dryer and cooler; Sturtevant Engineering Co. Ltd., cyclones and fans.

Electrical equipment: Allen West and Co. Ltd., motor starters and control gear; H. Brace, electrical installation; Brush Electrical Co. Ltd., switchgear; Lancashire Dynamo and Crypto Ltd., electric motors.

Steam equipment, boilers, etc.: G. W. B. Furnaces Ltd., steam raising equipment; Pearsons Installations Ltd., boiler and furnace installation; Schieldrop and Co. Ltd., oil-fired furnace.

Additional BDH Biochemicals

Sugar phosphates and closely related substances are described in a new booklet published by British Drug Houses Ltd., Poole, Dorset, to provide useful data for workers in the biochemical field. Specifications are given for fructose 6-phosphoric acid, fructose 1:6-diphosphoric acid, galactose 6-phosphoric acid, glucose 1-phosphoric acid, glucose 6-phosphoric acid, inositol hexaphosphoric acid (phytic acid), mannose 6-phosphoric acid, 6-phosphogluconic acid, D(−)-3-phosphoglyceric acid and ribose 5-phosphoric acid.

Shell Offer Imported Polypropylene to UK

LIMITED quantities of polypropylene are now being offered to the UK chemical industry by Shell Chemical Co., 170 Piccadilly, London, W1, as a result of continuing research in the polyolefin field. For the present the quantities are limited and are intended for market assessment purposes.

Initial supplies, which will be sold by Shell Chemical under the trade name Carlona, are mainly intended for evaluation in the injection moulding field where higher softening point, rigidity and tensile strength of the material should open up many new applications for moulded articles. This plastics material is being manufactured by Shell Chemical, but not in this country (see also CHEMICAL AGE, 4 October, p. 556).

Proposed Changes in Poisons List and Rules

STATUTORY Instruments giving effect to recommendations made to the Secretary of State by the Poisons Board are being prepared. Proposed changes in the Poisons List and Rules are:

1. *Anileridine, dextromoramide, etoxeridine, levomoramide, methyldihydromorphine, morpheridine, myrophine, oxymorphone, racemoramide, trimeperidine, and the esters of 1-methyl-4-phenylpiperidine-4-carboxylic acid, and the salts of these substances*, to be added to Part I of the Poisons List and the First Schedule to the Poisons Rules. Existing entries relating to pethidine and the isopropyl ester of 1-methyl-4-phenylpiperidine-4-carboxylic acid and their salts will be deleted.

2. *Derivatives of 3-(10-Phenothiazinyl) propane substituted in the 1-position, and the salts of these substances*, to be added to Part I of the Poisons List and to the First and Fourth Schedules to the Poisons Rules. Existing entries relating to chlorpromazine and promazine and their salts will be deleted.

3. *Endrin* to be added to Part II of the Poisons List and to the First, Fifth (in respect of 'preparations for use in agriculture or horticulture'), Seventh, Eighth and Ninth Schedules to the Poisons Rules.

4. *2-Methoxycarbonyl-1-methylvinyl dimethyl phosphate ('Phosdrin')* to be added to the list of phosphorus compounds in Part II of the Poisons List, in Rule 14(2)(b)(vi) of the Poisons Rules and in the First, Third, Fifth, Seventh, Eighth and Ninth Schedules. It will also be added to the Sixteenth Schedule.

5. *Organic compounds of mercury in aerosols* to be included in the First Schedule to the Poisons Rules regardless of their percentage content of mercury, and also in paragraph 6 of the Seventh Schedule.

6. The entry in the second column of the Fifth Schedule to the Poisons Rules relating to *calcium arsenates* to be amended to read 'preparations for use in agriculture or horticulture'.

Birkenhead Postgraduate Courses

Two postgraduate courses on molecular spectroscopy and the chemistry of co-ordination compounds are announced by the science department of Birkenhead Technical College. The course on molecular spectroscopy will be held on Monday evenings starting on 5 January with an introductory lecture by Mr. J. Rose of the college. Other lectures will cover: electronic spectra of diatomic and of polyatomic molecules, applications in biochemistry, photochemical kinetics; microwave and flame spectroscopy.

The course on the chemistry of co-ordination compounds has already started and comprises 19 lectures which are held on Tuesday evenings.

HINCHLEY MEDALLIST ANSWERS CRITICS OF GRANT-AIDED RESEARCH ASSOCIATIONS

SOME of the criticisms made about grant-aided research associations were examined by Mr. John Wilson, lately director of research, British Rayon Research Association, in his Hinchley Memorial address to members of the British Association of Chemists on 29 October. Such an examination, he thought, would help in clarifying ideas regarding the real functions of the associations.

The late Herbert Levinstein in his Hinchley Memorial address in 1953 had said that the research associations did not make any material contribution towards the export market. Research in itself was valueless. It was only valuable when applied and it could not be applied if the results were open to the whole industry. In his opinion, therefore, firms should undertake their own research.

Mr. Wilson did not think that anyone, least of all the research associations, would suggest that individual firms should not carry out their own research. The mistake the critics were making was in assuming that research by individual firms ruled out the need for co-operative research. Nothing could be further from the truth for the two types were complementary.

The function of the research association was to establish general principles, while that of the industrial laboratory was to apply those principles to its own production problems, and to develop improved selling lines. It was obviously cheaper to attack common problems on a co-operative basis than for individual firms to attack the same problem independently and at the same time.

There were companies which thought that payment of their subscription gave them the right to demand that everything should be handed to them on a plate, that research staff should be available at a moment's notice and that member service should have priority, in other words that research projects should be dropped at once to free staff to deal with passing snags.

That type of immediate assistance made inordinate demands on the association's manpower and absorbed resources which should go into research. Member service could not possibly flourish in a vacuum. To be successful it must be backed by an extensive and up-to-date research effort, and its real purpose should be to lead the technical advance of the very best firms.

Information Services

Research was useless unless it was applied and to be applied it had to be known and understood. Some form of information department was therefore vital for every research association. Such a department however could trespass on the work of ASLIB or the abstracting journals or of the DSIR information division.

Mr. Wilson suggested that the information centres of the various associations might be integrated, with the DSIR information division assuming responsibility for all the non-secret information, with the research associations being responsible for information confidential to members. Each centre would be run as a unit, but the cost would be shared between the association and DSIR, relieving the friction and releasing funds for research.

Sir Lawrence Bragg in an address to the Royal Institution had said that the flow from associations of fundamental ideas which would profoundly affect British industries had not yet reached the volume that had been anticipated. One cause of the failure, according to Sir Lawrence, was a wrong conception of the nature of research; the associations should become not bodies of men but bodies of equipment, places with a nucleus of permanent staff, accumulated traditions and techniques peculiarly their own.

Cram Courses

While Sir Lawrence's suggestion that men should be encouraged to go to the association both from industry and from university for short periods of intense work might be adopted, Mr. Wilson felt that success would depend on having a virile organisation in full operation and not merely a collection of specialised equipment with a nucleus staff.

A second cause of failure suggested by Sir Lawrence was that it was futile to direct research by committee. Mr. Wilson said that committees were useful for defining the precise nature of an industrial problem or for discussing a project while work was in its early stages. Too many committees, however, were not desirable.

Sir Lawrence's third suggested cause of failure was the danger of 'fossilation' inherent in isolated groups of research workers. That was a danger, but Mr. Wilson did not think there was any need for it to happen.

It had been stated that the research associations should become the source of ideas likely to have a far-reaching effect on industry. Such ideas could only come from new knowledge, which could only come from fundamental research.

That fundamental research could not be carried out at the universities since they insisted on complete freedom of action, a claim that was irreconcilable with the systematic disciplined exploration of a specific field, required by industry. Therefore, the greater part of the work should be undertaken by industry itself.

Successful fundamental research, however, required the simultaneous impact of different disciplines, the reconciling of conclusions based on one set of premises with conclusions based on another. It needed freedom to discuss and freedom to publish—an atmosphere which it was virtually impossible for the industrial research department to provide.

The universities and the research laboratories of individual firms having been ruled out, only the research associations were left. They had the resources; they controlled comprehensive teams of research workers from many branches of science; they could provide the atmosphere in which fundamental research could flourish, and since they did not claim complete freedom of action, they could accept directives from industry.

Improvement Necessary

At present, the output of first-class fundamental research from the associations was, with some exceptions, deplorably low. It could, however, be increased materially.

Concluding, Mr. Wilson said that the research associations had a duty not only to help industry today but to lay the foundations for the industry of tomorrow. To do that they had not only to carry out sound technological research, with a view to raising the level of technical efficiency; they had to initiate a comprehensive programme of fundamental research with a view to uncovering new facts on which improved processes could be based. They had to become centres for intensive specialised effort, channels through which industrialists could be brought into contact with the immense reserves of knowledge and ability that existed in British universities.

Depression in Man-made Fibres Industry

COMPARISON between the recent depression in the man-made fibres industry with that in 1952 was made by Sir William Palmer, chairman of British Man-made Fibres Federation, in his speech at the annual meeting. The textile industry as a whole had suffered and he expressed the hope that a parallel improvement would take place as had happened in early 1953 when demand was actually in advance of supply for short periods.

Fall in production of filament and staple man-made fibres was only 20 per cent now as against 40 per cent in 1952, while production of woven cloth fell 20 per cent as against 30 per cent in 1952.

Triacetate and synthetics had not altogether escaped the depression although they had continued to make relatively greater progress than the older fibres.

Chemist's Bookshelf

'LIVE' APPROACH TO CHEMISTRY

20TH CENTURY CHEMISTRY. By *J. I. Routh*. 2nd edition. W. B. Saunders Co., Philadelphia and London. 1958. Pp. xviii + 613. 45s 6d.

In his preface the author states that this book is written for students 'whose course is undecided and who require a year of chemistry to round out other scientific subjects.' This may fit into the US system of education but it is difficult to call to mind any approved British course of study for which it could be called a suitable text book.

First impressions on a quick perusal suggest a mixture of popular science and complicated formulae quite beyond the reader for whom it is intended. Many of the illustrations have no technical meaning and, to mention one in particular on page 529, show little appreciation of catering for the psychology of the British reader. A more detailed study, however, reveals sections which are much more valuable and Chapter III on atomic structure is as lucid and concise an introduction to inorganic chemistry as will be found in any English text book catering for advanced level G.C.E. or an Intermediate B.Sc. examination. Chapter IV then gives a popular science view of nuclear energy and the book reverts in Chapters V and VI to a more student-like approach to the classification of the elements, valency and chemical equations. The remainder of the first half is a mixture of inorganic and physical chemistry in which most of the explanations are good but they are interspersed with sections in which the text is either unnecessarily elementary or much too complex for a student really to understand. The treatment of the metals is sketchy, only eleven of them being included at all in Chapter XVIII which deals with the metals. The alkaline earth metals are completely ignored.

The middle section of the book is organic and passes from fundamentals which are treated quite adequately, to the alkaloids and high polymers in the space of 120 pages frequently occupied with not very instructive illustrations. In the chapter on high polymers the thermosetting plastics are dismissed in no more than 300 words, including several misleading phrases.

In the final section on biochemistry the author is in his own territory but he appears to cram far too much into the 170 pages. This results in many important steps in the organic chemistry development being omitted and the complicated formulae quoted thereby lose much of their value.

As a text book for students, however, a most serious criticism is the price, which at 45s 6d is beyond the reasonable level for either the student to buy individually or the education authority to purchase in bulk. It would have been far more useful for the British market if the work had been divided into two less elaborately produced volumes, the one as an introduction to inorganic and physical chemistry and the other as an approach to organic and biochemistry. As it is the single volume can be recommended to the serious teacher who will appreciate the refreshingly clear approach to some of the fundamental concepts of the modern principles of chemistry and will find the remainder interesting for the methods it uses to make the introduction to chemistry a more live subject.

J. H. COLLINS.

Chemistry for the Layman

A STRUCTURAL INTRODUCTION TO CHEMISTRY. By *E. T. Harris*. Blackie and Son, London, 1958. Pp. ix + 181. 12s. 6d.

This is chemistry for the layman. The treatment is elementary, often ingenious, and generally easy to follow. Here and there, however, are passages which might mislead. Thus, on reading p. 32, many readers would no doubt get the impression that the enthalpy change is a valid criterion of what makes a reaction go. Although the entropy term is subsequently considered, the real significance of 'free energy' is not established. This is hardly surprising because such a concept is not really for beginners and cannot be expressed simply and unambiguously; there is no royal road to thermodynamics. On the other hand, the subject of 'resonance', noted for its ambiguities, is introduced with considerable skill; the treatment here will be a help to all teachers of sixth form and first year university classes.

The scope of the book is best indicated by the chapter headings which are as follows:—the kinetic theory; the architecture of the atom; the atom becomes an ion; the formation of molecules; polyatomic ions; elements; ionic compounds; reactions of ionic compounds; covalent compounds; reactions of covalent compounds.

There are a couple of minor blemishes. Firstly, there is the use of the term 'receptor' (p. 53); the proper term is 'acceptor'. Secondly, the expression 'polyatomic *atoms*' (p. 76) is clearly meant to read 'polyatomic *ions*'. The production is, however, good on the whole and the price is not unreasonable.

H. MACKLE.

Special Theory of Relativity

SPECIAL RELATIVITY FOR PHYSICISTS. By *G. Stephenson* and *C. W. Kilmister*. Longmans, Green and Co., London, 1958. Pp. 108. 18s.

This book is a concise and coherent account of the special theory of relativity, the mathematical understanding of which requires only a knowledge of three-dimensional vector analysis. Half the book is taken up with the Lorentz transformation and its immediate consequences and the remainder with applications of it to optics, dynamics and various topics in modern physics. These applications are well chosen and demonstrate the importance of the special theory in the interpretation of a wide range of phenomena.

The writing is almost uniformly lucid and the material is very suitable for the purposes of an honours degree in physics. Its usefulness in this context would be enhanced by the inclusion of some problems.

It is unfortunate that not all British chemists have the necessary mathematical background for it is unlikely that a simpler correct presentation of the theory can be given, and some familiarity with the special theory should be an essential part of the education of a scientist or an engineer.

A. DALGARNO.

Yale Course on General Biochemistry

GENERAL BIOCHEMISTRY. By *J. S. Fruton* and *S. Simmonds*. 2nd edition. Published by John Wiley and Sons Inc., New York, US. Pp. 1077. Price 144s.

This book is based on a general biochemistry course given at Yale University. The course is not limited to students of biochemistry but is attended by research workers in the biological sciences, medicine and chemistry. Although the book emphasises biochemistry as a separate discipline, it is planned to serve a wide audience.

In contrast to other textbooks of biochemistry the authors have adopted an unique arrangement of the material. The extensive introductory section deals with protein chemistry and emphasises the role of this class of compound in living matter. Several topics of physical chemistry which are of importance in biological systems are also dealt with. In the next section attention is focused on the catalytic role of proteins in metabolism and the elementary principles of thermodynamics and kinetics as applied to biological systems are discussed. The third and major part of the text is devoted to problems of intermediary metabolism, those of the fats, proteins and carbohydrates. Finally, the authors consider vitamins, hormones and metal ions with particular respect to what is known of the metabolic role of these groups of compounds of enzyme-catalysed reactions.

There has been an extensive revision

in this new edition of a number of chapters, particularly those on intermediary metabolism dealing with such aspects as the alternative pathway of glucose oxidation. There is, in addition, new information on protein structure and biosynthesis and oxidative phosphorylation.

This is an excellent book and should prove of value not only to biochemists but to research workers in any of the biological sciences and those branches of chemistry dealing with natural products. The extensive bibliography affords the reader a rapid introduction to the latest literature of nearly the whole of biochemistry.

K. R. REES.

Fundamentals of Organic Chemistry

A MODERN APPROACH TO ORGANIC CHEMISTRY. By *J. Packer* and *J. Vaughan*. Oxford University Press. 1958. Pp. x + 973. 84s.

So great is the number of compounds formed by carbon—an ever-increasing number, due to the synthesis of new substances every day—the chemist is compelled to deal with them as a separate branch of his subject, *viz.*, organic chemistry. Fortunately, however, intensive work within the last 30 years on the quantum-mechanical interpretation of structures and valency has helped to co-ordinate a great deal of the general factual body of organic chemistry. Many interesting problems thus arise in the presentation of the subject to the student and this scholarly new work attempts to solve some of those which will confront him in the post-intermediate years of his course.

This book rests firmly on a foundation—laid in the introductory chapters—of quantum mechanical principles applied to the structure of the atom, the nature of valency bonds, and the mechanism of chemical reactions. To make clear such fundamentals in a descriptive qualitative way, without recourse to mathematics, is a difficult task which the authors have tackled with a remarkable degree of success. Throughout the 973 pages of this large book fundamental principles and chemical facts are carefully interwoven, so that comprehension and absorption of the latter is facilitated. At the same time a critical approach to reaction mechanisms is encouraged.

Any attempt to treat of organic chemistry within the confines of one volume leads unavoidably to selection and exclusion. Thus, although this work deals with the preparation, properties, reactions and structures of the simpler, commoner straight-chain and cyclic compounds (including sugars), complex naturally-occurring substances such as the polysaccharides, the proteins, nucleic acids and the steroids are omitted.

The special honours man will find Packer and Vaughan an indispensable addition to his library. It will also be of great help to the graduate of mature years who wishes to keep up to date with organic chemistry.

K. STUART.

Chemist's Bookshelf

Absorption Spectroscopy

AN INTRODUCTION TO ELECTRONIC ABSORPTION SPECTROSCOPY IN ORGANIC CHEMISTRY. By *A. E. Gillam* and *E. S. Stern*. 2nd Edition. Edward Arnold (Publishers) Ltd., London. 1957. Pp. 326. 50s.

In spite of the rapid growth of absorption spectroscopy and consequent need for reliable text books on the subject, comparatively few have been published and the first edition of the present book obviously met with a warm welcome since a second edition has been called for after a relatively short interval.

The new edition has been slightly enlarged to take account of a greater variety of spectral data and experimental techniques likely to be of interest to the organic chemist. Some account of modern spectrophotometers has been given, but here there is a danger that information is liable to be out of date before the book is printed. For example, there is no mention of a British recording spectrophotometer and only the briefest reference to a grating instrument, yet at the present time British instruments with one or both of these features are in regular production.

A brief theoretical discussion of absorption is given (9 pages) while the question of band intensity is dismissed in half a page. However, there is an extensive bibliography together with some 500 references to original work. Among other topics dealt with in the book's 16 chapters are the following: laws of absorption; nomenclature; instrumentation; colour and constitution; absorption due to one or more chromophores; effects of conjugation and resonance; absorption of benzenoid and heterocyclic compounds; detection and identification of organic compounds; quantitative measurements; problems of molecular structure.

As would be expected in a second edition, obvious errors are commendably few, but a slight inconsistency in the spelling of inflexion (inflection) was noted.

One point of criticism of a book which is otherwise well and attractively printed is the atrocious quality if some of the figures depicting absorption spectra.

This book can be heartily recommended as an introduction to the subject.

A. E. MARTIN.

Arab Potash Dead Sea Project will Utilise German Process

IMMEDIATE task in the Arab Potash Co.'s project, aimed at the recovery of potash and other mineral substances from the brine of the Dead Sea, is to rehabilitate the area designated for carnallite solar pans and the construction of a pilot plant for the production of potash. At present about 1,000 men under the supervision of L. H. Manderstam and Partners, consulting engineers, 38 Grosvenor Gardens, London SW1, are engaged at the north end of the Dead Sea.

The installation and operation of the pilot plant is intended mainly to provide data on new processes and new techniques which will be applied on a pilot scale, before the design in the near future of a commercial scale plant.

The soil of the area chosen for the construction of solar pans is heavily contaminated with salt. Much of the surface is of a porous nature, creating problems in regard to 'seepage' of the brine. The application of 'certain techniques and special materials' is stated, however, to have enabled the difficulties to be overcome and to have reduced the time normally allowed for the 'seepage phase'.

A pipeline in plastics has been chosen to cope with excessive corrosive action of brine. Once the area is 'flooded' with brine, the liquid will be concentrated by solar evaporation and, as concentration proceeds, the salt and the mineral substances will be precipitated progressively in the pans of the 'catchment' area. The carnallite will be harvested and treated for recovery of the potash. The pilot plant is expected to start operations in about nine months.

The whole project, when implemented, is estimated to cost about £4.5 million. It is considered that the processes, which are German, applied to the project will be more efficient than those in operation in other countries, using the same source of raw materials.

New Edition on Standardisation of Pesticides

SINCE the first publication for specification and analysis of pesticides in 1934, joint committees of the Association of Manufacutrers of Agricultural Chemicals have collaborated with the Ministry of Agriculture, Fisheries and Food and the latest edition of Technical Bulletin No. 1 brings the information up to date.

Rearrangement of the text into three distinct parts dealing respectively with specifications, methods of analysis and a miscellany, makes for clarity and a comprehensive index has been added. All methods of analysis are based on the results carried out in many laboratories.

Technical Bulletin No. 1, price 7s (7s 6d by post) is obtainable from H.M. Stationery Office or through any bookseller.

SIMON-CARVES GROUP WORKS ON 30 SULPHURIC ACID CONTRACTS

WORK in progress and recently completed by the sulphuric acid division, chemical plant department of Simon-Carves Ltd., Cheadle Heath, Stockport, covers about 30 contracts in seven countries.

Recent orders for the division include a 120 short tons per day sulphuric acid plant for Harmony Gold Mining, a 10 tons per day plant for Arnhol and Co. for Malaya, sulphur-burning and waste heat recovery equipment for the Dutch State Mines and sulphur-burning equipment for Hartesbeestfontein Mine, Transvaal.

In the UK, the sulphuric acid plants for Laporte Titanium at Stallingborough and Fisons at Immingham and the acid recovery unit at the BP Isle of Grain refinery have been put to work. Also in operation are the oleum and sulphuric acid pot concentration plants for ICI at Gima, India.

Simon-Carves (Africa) have commissioned the sulphuric acid plant at the new Rodia fertiliser factory, Salisbury, while a sulphur dioxide plant is ready for commissioning for Umfolozi Co-operative Sugar Planters. The acid plant for Fisons at Sasolburg and the sulphur-burning plant for the SA Industrial Cellulose Corporation are being erected.

Acid plants have been commissioned for Mary Kathleen Uranium in Australia, and for two New Zealand fertiliser companies. An acid plant for Shell at Geelong is nearing completion.

Precipitators

In the precipitator division, plants put to work include tail gas mist precipitators for the United Sulphuric Acid Corporation, Widnes. Work is in hand on 16 installations for chemical plants and power stations.

Gas division plants now operating include detarrers for the West Midlands Gas Board, Wellington, and the South Yorkshire Chemical Works and precipitators for the gas cleaning plant extensions of British Titan Products at Grimsby. New orders include three gas dehydration plants for the Southern Gas Board at Southampon, Reading and Hilsea.

Power plant department of Simon-Carves has received an order from Monsanto Chemicals for an 80,000 lb./hour oil-fired boiler at their Newport works.

Acid section of Huntingdon, Heberlein and Co. Ltd. states that the wet contact plant supplied through Woodall-Duckham for the North Thames Gas Board at Beckton is operating and that erection of the acid concentration plant for Pakistan is nearing completion. Erection is almost completed on extensions to the Norsk Spraengstof acid plant, Oslo.

Chemical Engineering Wiltons Ltd. have recently been granted a licence by the Dutch State Mines for their process of continuous acid washing of benzole. They have also become licensees for the supply of Spraypak for distillation and absorption columns.

Wiltons state that the 75 tons per day tar distillation plant for Salamon and Co. is now operating in Essex and that the conversion to concentrated ammonia liquor of the Scottish Gas Board's ammonia sulphate plant at Provan is ready for commissioning.

In South Africa, the 100 tons a day tar distillation plant of Iscor at Pretoria has been commissioned while the 100 tons per day tar distillation and water softening plants for Iscor at Vanderbijl Park are nearing completion.

Orders for Wiltons include an increase of throughput of the tar distillation plant built some time ago for the Normanby Park Tar Supply Co. and a 125 tons per day tar distillation plant for Bitmac Ltd.

Simon Handling Engineers Ltd. state that the extension of the ICI fertiliser factory at Heysham is well advanced. New orders include an extension of the Aqaba phosphate plant, acetate storage and handling equipment for the acetate rayon plant which Courtaulds are building in Russia and an antimony oxide handling and storage plant for Associated Lead Manufacturers.

Water Research Association Extends Membership to Industrial Users

ORDINARY membership had been extended to include users of water for industrial purposes, it was stated in the third annual report of the Water Research Association just published.

Reserves, as in previous years, had been used to support research which was costing more than current income, although the programme had been confined to continuing and expanding work already established. The actual figures quoted were £23,000 on research and £8,000 on the new site at Medmenham, Buckinghamshire, while current membership income was £21,000. The money allocated was divided approximately as 35 per cent on basic research, 39 per cent on applied research and 26 per cent on library, information and advisory services.

Water purification was the main theme of the work of the research division which was initially concerned with studying the fundamental mechanism of the chemical coagulation process of water treatment.

On the analytical side, the absorptiometric determination of aluminium in water was investigated and the most satisfactory method was found to be one in which the sample was pretreated to remove the fluoride ion. A full report was given in Technical Publication No. 8, 'Absorptiometric Determination of Aluminium in Water.'

The use of plastics pipes was another factor under consideration and much work was being undertaken to determine the amount of lead that can be leaked out of a p.v.c. pipe containing lead compounds as stabilisers. All the samples examined had given results well within the specification of the Dutch institute for testing waterworks materials, KIWA.

Another series of investigations concerned the permeability of plastics pipes to coal gas. It has been shown that high-density polythene is permeable in the same way as low-density material, but that penetration takes longer.

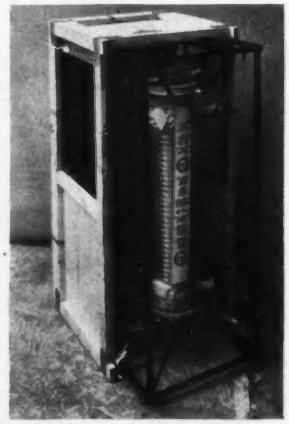
Pressure tests to estimate the long-term endurance of plastics pipes are of two kinds, high pressures between 400 and 1,000 p.s.i. and a lower pressure at 240 p.s.i. Low-pressure tests may take several months to complete and 32 pipes have been installed at an East Surrey pumping station where the apparatus is inspected daily. Technical Publication No. 10, 'Present knowledge concerning the mechanical properties of polythenes used in water supply' summarises information obtained from recent visits.

Hygrotherm Gain First Soviet Order

V/O Technopromimport, Moscow, have recently awarded to Hygrotherm Engineering Ltd., London, a contract for a fully automatic heating and cooling plant to be used in the manufacture of synthetic resin. This is Hygrotherms' first chemical engineering project in the USSR.

The plant will consist of heat generators, circulating pumps and control equipment. An organo-silicate heat-transfer medium, Hygrotherm PAS-190, will be used in the plant.

QVF 'Visible Pack'



Q.V.F.'s new 'visible package' and condenser. Since adopting this pack there have been no breakages, state the company. See Distillates, p. 758, for further details

Overseas News

WEST GERMAN CHEMICAL INDUSTRY'S PROSPERITY EXPECTED TO CONTINUE

WEST German chemical industry was of the opinion that the increase in business and expansion of production, which had brought with it such prosperity in 1957 and this year, would continue in 1959 and place the German industry in an even better position for the heavy competition it would have to contend with once the European Common Market had been set up. Growth in turnover for the current year was expected to be about 7 per cent, with the larger chemical undertakings having increased their business to a greater extent than the medium-sized companies.

These points were made by Professor Ulrich Haberland, president of the German Association of the Chemical Industry, at the association's annual meeting. The professor, who was elected president of the association for a further term of office for the year 1958-9, stated that the country's chemical industry had recently made payment of another DM2 million (about £167,000) for research and experimental work. This brought the total of such payments to DM3½ million (some £292,000) since the beginning of this year and DM15 million (about £1,250,000) since 1950.

During a subsequent discussion, Professor Haberland said that the West German chemical industry had no plans afoot to concentrate and form trusts, cartels and the like. It was the last industry group that would make any attempt to break up the 'middle-size' system and force a merging into giant groups. Quite apart from that, even if such an attempt were to be made within the bounds of the chemical industry, it would be doomed to failure because of the very nature of the industry. Also, he added, the three large successors of the liquidated I. G. Farben group (Badische Anilin- und Sodafabrik AG, Farbenfabriken Bayer AG and Farbwerke Hoechst AG) had no intention of trying to invade the smaller producers and take them over.

Silica Aerogel as Insecticide

Inorganic coated silica aerogel, in which Davison Chemical Division of W. R. Grace and Monsanto Chemicals of the US are interested, is reported as a new insecticide. It acts by attacking the waxy coating which protects the body moisture of insects. A 100 per cent kill is reported on many insects, in particular cockroaches and dry wood termites. Other possible applications are in attacking fleas, mites, flies, ants and similar pests.

Advantages claimed for this aerogel are: nontoxicity to humans and animals; insects have not developed resistance; indefinite effectiveness as there is no decomposition. Limitations of the insecticide are that its effectvieness is reduced by any application in water or outside where rain and dew may occur.

West German Firm Raises Polythene Capacity

The polythene capacity of the Rheinische Olefinwerke, GmbH, who market the material under the trade name of Lupolen, will be increased to 35,000 metric tons a year by improvements now being made to their plant that are scheduled for completion early in 1959. Further extensions will then be put in hand which by autumn 1959 will also enable the plant to produce linear-polythene by the Phillips process.

New Production Unit for Synthetic Resins in Mexico

Local demand for synthetic resins and special emulsions should be fully met by the production from a new factory in Colonia Industria Vallejo, which has been opened by Reichhold Chemicals de Mexico SA, who have increased their paid-up capital from 400,000 to 1,000,000 pesos.

New Synthetic Rubber Plant for Poland

Poland's synthetic rubber capacity is to be expanded considerably with a new plant at Oswiecin, due to come into operation next year. Annual capacity of this plant will be 20,000 metric tons; by 1970 rated capacity will be raised to 70,000 tons, states the Polish Ministry of Trade.

Chemical Production in Mexico Far Below Consumption

Although the total value of chemical products manufactured in Mexico rose to 3,510 million pesos in 1957, total consumption was 1,669 million pesos more.

Japanese Interest in Polycarbonates

In June 1958, Kunoshima Chemical Co. Ltd., Osaka, Japan, started pilot production of polycarbonates at a plant at their works at Mihara (Hiroshima Province). Capacity at present is stated to be 1 ton per month, but is to be raised during the course of this year to 1 ton a day and later, as demand builds up, to 3 tons a day. The experimental product will be marketed mainly in the form of film. Price will be 2,000 yen (£2 approximately), but will drop by half as soon as capacity is increased.

Kunoshima Chemical Co. is a subsidiary of one of Japan's largest synthetic fibre companies, Teikoku Rayon Co. Ltd. This company is at present investigating the suitability of polycarbonates as synthetic fibres and making experimental fibres from them.

Russians Claim to have produced Five Million Atmospheres

Tass, the Soviet news agency, reported recently that Russian scientists had now succeeded in producing pressures of five million atmospheres. These hitherto incredibly high pressures, said Tass, were 10 times higher than any previously attained in the US.

Montecatini Expansion Plans

Following the announcement of expansion plans in the plastics and petrochemical fields by Societa Montecatini of Italy (see CHEMICAL AGE, 1 November, p. 727) it is reported that the capacity of the Ferrara plant for production of polypropylene will be increased to 20,000 tons polypropylene a year. The expansion will be designed to permit the output to be raised to 30,000 tons if required.

The new type of polypropylene fibre which has been developed is stated to be remarkable for its lightness (specific gravity 0.91 compared with 1.31 for wool and 1.5 for cotton), resistance to pull, elasticity, and excellent ironing properties. A new plant with an annual capacity of 5,000 tons, is to be installed in Italy to manufacture the fibre. Provisions are being made to allow doubling of this output at short notice.

New Technique for Italian Sulphur Industry

If the new Motosi plant for the production of pure sulphur fulfils all that is claimed for it, the present situation in the Sicilian sulphur mines might well be greatly improved. The plant operates in the mine and processes the material as it is excavated, producing sulphur in powder form ready for use in agriculture or the chemical industry.

Until now it has been believed that no modernisation of existing plants could bring down the cost of production of sulphur in Sicily to the level of that afforded by the Frasch method which itself could not be used in the type of bed found in Sicily. The only alternative seemed to be processing the sulphur into sulphuric acid, fertilisers and other commercial chemicals.

By 1972 about three million tons of sulphur (in the form of sulphuric acid) will be needed annually for production of uranium oxide in the West and as the Italian nuclear power stations are plan-

ned for southern Italy, this might well be another source of prosperity for the Sicilian sulphur mines.

Cost of production by the Motosi plant is reduced to about 20,000 lire per ton which is approximately 10 per cent less than the price of American sulphur. Capital cost is also considerably less, e.g., 30 million lire compared with several hundred million required for a Gill furnace.

Ammonium Sulphate Plant for West Germany

Production of ammonium for sulphate at an annual rate of about 50,000 metric will probably start at the end of this year at the Krefeld, West Germany, plant of Stickstoff-Werk Krefeld GmbH, a nitrogen-working concern owned 50 per cent by Wasag-Chemie AG, of Essen, and 50 per cent by the Union Rheinische Braunkohlen-Kraftstoff AG, Wesseling. The company will work in connection with the Krefeld plant of Guano-Werke AG, converting the waste gypsum thrown out as slag by Guano-Werke into ammonium sulphate.

Inauguration of New Chemical Plant by Celanese Mexicana SA

North of Mexico City, a new formaldehyde, synthetic resin and polyvinyl plant has been inaugurated by Celanese Mexicana SA.

Joint German-Italian Firm to Produce Vinyl Chloride

A new company, Società Chimica Ravenna SpA has been formed by ANIC, Milan, and Wacker-Chemie GmbH, Munich, holding 51 per cent and 49 per cent respectively of the shares. The new company is to set up a plant for the production of vinyl chloride. Part of its production will be further processed into p.v.c. by Wacker-Chemie, the balance will be sold to various Italian chemical producers.

Dangers of 1-Chloroaziridine

Under certain conditions, 1-chloroaziridine can explode violently. US research investigator Allen F. Graefe, Aerojet-General, prepared 1-chloroaziridine as part of the preparation of 1,1' biaziridine. Chlorine was added to an aqueous solution of sodium hydroxide kept at −5° to −10°C. Ethylenimine was then added with stirring to the resulting hypochlorite solution; crude 1-chloroaziridine separated as a colourless upper layer.

The 1-chloroaziridine was removed, washed with distilled water, dried over anhydrous magnesium sulphate, and then distilled through a 12-in. column at 37.5° to 38.3°C and 245 mm. The compound is described as a mobile, colourless and strongly lachrymatory liquid.

A flask containing some 20 ml. of 1-chloroaziridine, which had been stored for several months at about 0°C, was found to have a 'frozen stopper.' As this could not be removed, the flask, with its contents showing no apparent signs of decomposition, was dropped into a disposal pit. The flask exploded with a violence compared to that which might be expected from nitroglycerine. As much as 1 litre at a time of 1-chloroaziridine had previously been handled without incident.

Compatibility of Volatile Corrosion Inhibitor with Rubber

For the preservation of ferrous metal items where rubber fabrications are an integral part of the preserved item, volatile corrosion inhibitor (VCI) papers have been recommended by R. L. Le Mar, Rock Island Arsenal US Army. The papers were found to have far less effect on rubbers than most oils.

In the tests, commercial VCI papers were wrapped round samples of representative rubber formulations. The combinations were exposed to dry and moist ageing at 130°F. Effects of the VCI were determined by analysis of volume change, elongation, and tensile properties of the rubber. One type of papers was found to have a tendency to cause changes in the appearance of the rubber surface. The papers in contact with rubbers were also observed to show visually apparent effects upon themselves. Swelling, elongation and tensile strength properties of the rubbers, however, usually showed only slight effects. Storage of VCI-rubber combinations in high moist environments was noted as lending to increase rubber swelling. The full report of these investigations is obtainable from the Office of Technical Services, US Department of Commerce, Washington 25, D.C. Order PB131544, price 75 cents.

New German Plant for Hydrofluoric Acid

Now being built by Fluorwerk Dohna, near Pirna, in Bau, is a new plant for hydrofluoric acid production. Design work has been aimed at improving the process to be used so that no effluent gas is evolved. The hydrofluoric acid will be used for the preparation of refrigerant products, pure chemicals and pharmaceuticals. Production capacity is such that enough hydrofluoric acid will be available for internal use as well as substantial quantities for home and export markets.

The new plant designed at Dohna has 11 double retorts with 44 passways. Previous designs only had 10 passways. The new process combines production of hydrofluoric acid with conversion of by-product gypsum to synthetic anhydrite. The gypsum was dumped previously. Scheduled date for start-up of the plant is 1959.

Argentina buys German Chemical Companies

In the second stage of the auction sale of former German companies in Buenos Aires, the Argentinian Government purchased the chemical concerns of La Quimica Bayer and Anil-Dinie, both I.G. Farben successors. The prices paid were 42.3 million pesos (just under £1 million) and 17.05 million pesos (£341,000 approximately) respectively.

US May Raise Import Duties on Tartaric Acid

A US Government committee is to investigate the desirability of raising import duties on tartaric acid. Representations have been made by US manufacturers that these should be increased.

Expansion by Chemical Plant Suppliers in Mexico

Oronmex SA is the new name of Constructora Oron SA, the Mexican subsidiary of the Italian Oronzio de Nora Impianti Electrochimichi of Milan, who are doubling their capital for expansion purposes. The soda ash and chlorine plant for Industria Chimica Pennsalt, reported to be the largest of its type in Mexico, was supplied by them. This planned extension will mean that in Latin America the Mexican company will be the main distributors of Solway process soda ash equipment as well as plants for ammonia, nitric acid and fertilisers.

New E. German Route to Acetaldehyde by Vinylising of Alcohols

EAST GERMAN chemical concern, VEB Chemische Werke Buna, Schkopau, have introduced a new process for producing acetaldehyde from acetylene without the use of a mercury catalyst. It is stated that in present methods, mercury or mercuric oxide are always used as a catalyst for the hydration of acetylene, all other catalyst systems having been shown to be less efficient. Chemische Werke Buna sought to avoid the use of mercury or mercuric oxide on grounds of toxicity, expense and the need to import mercury.

As a result of their research, the concern has devised a process to produce acetaldehyde by the vinylising of high-boiling alcohols. The alcohols found particularly effective have been dihydric alcohols such as glycol and diglycol, which with acetylene form a low-boiling acetal. A synthesis of the required acetaldehyde could then be obtained from a study of the formation of such an acetal.

In carrying out the necessary final synthesis, small quantities of sodium lye and acetic acid were needed. This work was reported by the company in a paper read at the annual meeting last week in Leipzig of the Chemical Association of the German Democratic Republic.

PEOPLE in the news

● MR. L. H. WILLIAMS, a member of the main board of ICI, and DR. J. AVERY, chairman of its Dyestuffs Division, have been appointed directors of Ilford Ltd., with effect from 1 November.

● DR. C. H. GILES, PH.D. (LEEDS), F.S.D.C., F.R.I.C., senior lecturer in the Department of Chemical Technology, Royal College of Science and Technology, Glasgow C1, has been awarded a D.Sc. (Glasgow) for his published scientific researches in surface chemistry and adsorption, including the chemistry of dyes, dyeing processes and light fastness. He received the degree on 1 November. Dr. Giles is responsible for lecturing and research work in colour chemistry and dyeing in the department. Among his publications is the booklet 'Laboratory Course in Dyeing' (Society of Dyers and Colourists, Bradford, 1957), the first manual of its kind to be published for many years. In 1956 he was the gold medallist for research of the Worshipful Company of Dyers.

● MR. JOHN WOADE has been appointed managing director of the newly formed Blaw Knox Chemical Engineering Co. Ltd., 90-94 Brompton Road, London SW3 (see p. 752). Before joining Blaw Knox Pittsburgh, in 1956, he held numerous positions in administration, design, construction and operation of diversified chemical plants and has supervised many foreign engineering and construction contracts.. Mr. Woade graduated from Colorado University in 1940 with a B.Sc. degree in chemical engineering. Other directors will be MR. C. H. GRIST, chairman; MR. W. CORDES SNYDER, JNR. (USA), and THE HON. ALEXANDER HOOD.

J. Woade

● MR. T. H. BROOKE, managing director of Redferns (Bredbury) Ltd., has been elected chairman of the Plant Lining Group of the Federation of British Rubber and Allied Manufacturers.

● DR. HERBERT C. BROWN, professor of chemistry at Purdue University and an authority on the chemistry of boron, has won the 1959 William H. Nichols Medal of the American Chemical Society's New York section. Dr. Brown, born in London 1912 and who graduated from Chicago University in 1936, was co-discoverer of a method for the synthesis of boron hydride compounds. The method devised by Dr. Brown, with DR. H. I. SCHLESINGER (Chicago University) was first used to prepare boron compounds as part of the World War II atom bomb project. Since then, the materials have been developed further by Dr. Brown and their production has been vastly expanded for use in portable hydrogen generators and in the manufacture of drugs, particularly cortisone and related compounds.

● MR. MORTON E. BADER has been appointed a consultant to the 19-26 November meeting in London of the committee on insecticides of the World Health Organisation. Mr. Bader is insecticide quality control manager for the chemicals division of Olin Mathieson Chemical Corporation, New York. The meeting, at the Tropical Products Institute, will consider the specifications and chemistry of pesticides. Included on the agenda are a review of specifications for technical products and the consideration of current specifications for DDT 75 per cent wettable powders.

● MR. JOHN WILSON, C.B.E., M.C., M.Sc., F.R.I.C., who as announced briefly on 25 October, p. 695, has been awarded the Hinchley Medal of the British Association of Chemists, was presented with the medal last week by MR. GEORGE T. GURR, F.R.I.C., a past-president and a Hinchley medallist. Mr. Wilson who was awarded the medal shortly before his election as president of BAC, began his career in chemical research as a lecturer before transferring to industry as chief chemist for a firm of glass manufacturers. His next step was to become director of research of the British Rubber Producers' Research Association, after which he became the first director of research of the British Rayon Research Association, retiring from that post at the end of last year. When Mr. Wilson took up this post here there were no laboratories, no staff and no programme; in May 1955 the new BRRA laboratories at Whythenshawe were opened by Prince Phillip. Mr. Gurr said that Mr. Wilson had 'shown great technical ability and leadership of a high order'. Mr. Wilson's address on 'Grant-Aided Research Associations' is summarised in p. 761.

George T. Gurr, left, presents the Hinchley Medal to Mr. Wilson

● MR. H. R. HEWITT will relinquish the position of works manager at Orr's Zinc White Ltd., Widnes, at the end of the year to take up an appointment as general manager in charge of chemical production with another company. His successor at Orr's Zinc White Ltd. will be DR. H. MILLS, pigments technical manager of Imperial Smelting Corporation Ltd., Widnes. Dr. Mills was research manager at Widnes until November 1951, when the pigments research unit was transferred to Avonmouth. MR. E. A. BAILEY will shortly take up the position of assistant works manager at Widnes.

● SIR HUGH BEAVER opened a new science wing at St. John's College, Portsmouth, on Tuesday. The cost of £14,000 was provided by the Industrial Fund for Advancement of Scientific Education in Schools, of which Sir Hugh is chairman.

H. S. Henderson, managing director of Chemical Construction (GB) Ltd., who as announced last week has retired, is shown on the right talking to guests at the company's recent house-warming party held at their new offices in Henrietta Place, London W1. Guests were able to meet Mr. George G. Walker, president, and Mr. Lester Ginsburg, vice-president, of the Electric Bond and Share Co. (US), and Mr. James H. Curtis, president of the Chemical Construction Corporation, US. In 1955, Electric Bond acquired the US Chemico, with whom the London company is affiliated

● MR. J. W. PLOWMAN (Dewrance and Co. Ltd.) has been re-elected chairman of the British Valve Manufacturers' Association for 1958-59. MR. N. P. NEWMAN (Newman, Hender and Co. Ltd.) has been re-elected vice-chairman. New members of the executive committee are MR. F. S. HAM (Ham, Baker and Co. Ltd.), and MR. T. B. PATTISON (Alley and MacLellan Ltd.).

● MR. E. MITCHELL LEARMONTH, M.Sc., F.R.I.C., a director of British Soya

Seen chatting together after the inaugural meeting of the newly formed Paper and Textile Chemicals Group of the Society of Chemical Industry are, left to right: Dr. F. Liversedge (group hon. secretary and treasurer); R. C. Tarring (Shell Chemical, inaugural lecturer whose paper was entitled 'Petroleum Chemicals for Textiles and Paper'); Dr. A. K. Mills (vice-president, SCI); Col. Francis Griffin (general secretary, SCI); John Boulton (president, Society of Dyers and Colourists); Dr. H. A. Thomas (group chairman)

Products Ltd., the Grange, Puckeridge, Herts, has moved from Charlwood, Surrey, and his present address is Prouds, Thaxted, Essex. Mr. Learmonth serves on the council of the British Food Manufacturing Industries Research Association.

● MR. H. N. WIGAN has resigned from the board of the Amber Chemical Co. Ltd. MR. J. FIRMINGER, who joined the company at the end of 1957 and was appointed general manager home sales, is now appointed technical manager.

● MR. B. N. REAVELL, deputy chairman and joint managing director of the Kestner Evaporator and Engineering Co. Ltd., has left the UK for a brief Australian tour. He will spend some time at the offices of the associated company, Kestner Australia Pty. Limited, in Sydney and will then proceed on a tour of the various installations that the company has recently erected. He is expected to be in Australia for about four weeks.

● MR. DAVID E. BURTON, has been appointed to be in charge of the London technical sales department at Ibex House, Minories, London E.C.3, of Rocol Ltd., Swillington, nr. Leeds.

TRADE NOTES

Awards to British Firm

Under 'Protection of metal against corrosion,' Detel Products Ltd. were awarded a diploma of honour at the Brussels Exhibition, and under 'Pigments, paints, varnishes and artists' colours' a bronze medal was awarded to the Engineering Centre collective exhibit.

Sigmund Pumps

A new booklet, issued by Sigmund Pumps Ltd., of Gateshead, and available free on request, gives a comprehensive survey of the applications and adaptability of their products. It is well illustrated, showing many types of pumps and how they have been incorporated into plants in different industries at home and abroad.

Chemicals and Feeds Ltd

Chemicals and Feeds Ltd., Adelaide House, King William Street, London EC4, have been appointed sole UK agents for synthetic and organic pearl essence manufacutred by NV Chemische Fabriek 'Noord-Holland,' Beverwijk, Holland.

Information on Cobalt

A complete range of documentation concerning cobalt and its applications is at the disposal of all users of the metal, states the Cobalt Development Institute. The institute's address is 35, Rue des Colonies, Brussels, Belgium. There is also a centre at the Battelle Memorial Institute, Columbus Ohio, US.

Important research work is being carried out by Centre d'Information du Cobalt SA (CIC) which is entrusted with the execution of the Institute's programme. The work is being undertaken by a number of Belgian, Swiss, German and US laboratories. The investigations include both fundamental research and studies of a more immediate practical nature, of which some are stated to be likely to lead to applications for patents in the near future.

Change of Name

Chemical Construction (Great Britain) Ltd., Henrietta House, 9 Henrietta Place, London W1, have changed their name to Chemical Construction (GB) Ltd.

Brieger and Co. Ltd., dyestuff manufacturers, Dylon Works, Berryman's Lane, of London SE26, have changed their name to Dylon International Ltd.

Treatt, Bovill and Co., Ltd., essential oil merchants, 19 Watling Street, London EC4, have changed their name to R. C. Treatt and Co. Ltd.

Nickel Exhibition

At the College of Aeronautics, Cranfield, on 18 November, Mond Nickel Co. Ltd. are holding an exhibition, the theme of which is nickel, nickel alloys and related materials. Each afternoon during the exhibition the college will be open to visitors.

Trimellitic Anhydride

The Amoco Chemical Corporation, which recently started large-scale production of phthalic anhydride (CHEMICAL AGE, 11 October, p. 601), have now placed on the market commercial quantities of trimellitic anhydride. Full details may be obtained from the company's Chicago, Illinois, head sales office.

Exhibition of Mercer Equipment

To celebrate their centenary year, Thomas Mercer Ltd., St. Albans, Herts, are exhibiting a full range of their equipment at the Birmingham Engineering Centre, Stephenson Place, from 17 to 22 November inclusive.

Change of Address

Head offices and laboratories of British Soya Products Ltd. have been moved from London to The Grange, Puckeridge, Herts.

Fluid Controls in PTFE

Omega valves by Watson-Marlow Air Pump Co., Marlow, Buckinghamshire, are designed to control direction, volume and pressure in the flow of any liquid except fluorine and molten alkali metals. A booklet just published by the company describes the general and individual features of a range of these valves, stressing the advantages of the chemical inertness of PTFE and the fact that no lubrication is ever necessary. Watson-Marlow have also introduced a complete range of pipes, adaptors and fittings so that complete flow and control layouts are available in which the fluid touches nothing but PTFE.

Aerosol Federation Founded

An International Aerosol Federation has been formed with its base in Zurich. Members of the Federation will be Great Britain, France, Denmark, Italy, Spain, Switzerland and West Germany. The work of the federation will be to solve chemical and physical problems connected with the aerosol field and aerosol packaging. The association which has been mainly responsible for bringing the new federation into being is the West German 'Interessen-Gemeinschaft Aerosole', a group of experts which was set up early this year.

Baldwin Instruments

A team of application and design experts who will give free advice on the use of their fluid power and other equipment is one result of the Baldwin Instrument Co. Ltd.'s, Dartford, Kent, recent expansion. The other result is greatly reduced delivery times, in many cases now ex-stock.

Matthew Hall and ISR Plant

Matthew Hall and Co. Ltd., Dorset Square, London NW1, handled definitive engineering and procuring for the new Hythe plant of the International Synthetic Rubber Co. Ltd., acting as sub-contractors for the Blaw-Knox Co., Pittsburg, Pa. They were not concerned with civil engineering, which was looked after by John Laing.

Commercial News

- **Aspro's Clinical Products Purchase Approved**
- **Gas Purification Report Progress**
- **Simon-Carves Increase Interim Dividend**
- **New Danish Company To Make Nylon 6**

Aspro-Nicholas

Sale of the capital of Clinical Products Ltd. to Aspro-Nicholas has been approved at an extraordinary meeting of Clinical and General Industries. The company would be left with 120,000 Aspro-Nicholas 5s. ordinary shares worth today approximately £120,000 and some £82,000 in cash, after allowing for the redemption of £33,275 of unsecured loan stock, and payment of £26,250 for several properties.

Certain transactions now being negotiated should result in a gross investment income in a full year, including dividends on the Aspro-Nicholas shares on the basis of last year's distributions, equivalent to about 12 per cent on the nominal capital.

Baker Perkins

Acquisition by Baker Perkins of the issued capital of Steele and Cowlishaw and of Packman Machinery has been completed. Steel and Cowlishaw manufacture equipment for the chemical, ceramic, paint and colour industries, and Packman are designers, development engineers and manufacturers.

Purchase price for Steel and Cowlishaw has been satisfied by an issue of 70,886 Baker Perkins ordinary £1 shares, together with a cash payment of £50,000, and that for Packman by an issue of 37,975 ordinary shares.

Gas Purification

Considerable progress is reported by the chairman of Gas Purification and Chemical, Vice-Admiral Sir Charles Hughes Hallett, in getting the company back on to a sound footing. The group interim statement for the six months to 31 December 1957, showed a deficit, before tax, of £130,258; and the figures for the full year, reported 31 October, a deficit of £183,840. The trading deficit for the full period was £135,340. Trading at a loss is reported as having ceased during the second half of the year.

The figure of £183,840 arises owing to provision against the unsecured loan of £48,500 due to a company to which a receiver and manager had been appointed. An additional £14,500 was also paid to the former managing director and chairman under contract claims for service.

Year-end group-fixed assets were £830,943 (£825,566), net current assets £508,994 (£718,852) and the net cost of development outlay to date £44,788 (£23,734). Liabilities including overdrafts totalled £462,566 (£303,572).

Edward Webb and Sons

Profit for the year ended 30 June for Edward Webb and Sons (Stourbridge), fertiliser manufacturers, was £189,210 (£129,928). Net profit was £82,710 (£51,928). In view of the profits tax provisions of the Finance Act, the directors recommend that the final dividend should be maintained at 8 per cent. Because of the satisfactory position of the company, however, it is proposed to declare a special interim dividend of 2 per cent in respect of 1958-59. Total payment for 1957-58 is 11 per cent (same, but with interim on capital prior to one-for-four scrip issue).

Simon-Carves Ltd.

An interim dividend of 10 per cent less tax is recommended by Simon-Carves Ltd. in respect of the company's financial year ending 31 December 1958.

The increase of 2½ per cent over the interim dividend paid in 1957 is solely intended to reduce the disparity between the interim and final dividends and is no indication that the total dividend for 1958 will be greater than the figure of 25 per cent paid for 1957.

Trading results for 1958 are expected to be approximately the same as in the previous year.

Philblack

Net profit of Philblack, carbon black producers, for year ended 31 March was £205,866 (£266,137). Dividend of 12½ per cent (same) is declared.

Bayer AG

Turnover of Farbenfabriken Bayer AG, of Leverkusen, West Germany, rose in the first nine months of this year by 13.8 per cent over the total for the same period of 1957. Rate of growth of the company for the year as a whole will be about 7 per cent. The company's prospects for 1959 seem just as cheerful, said the chairman, Professor U. Haberland. Throughout the German chemical industry, a high productivity per man is expected to offset increases in wages and salaries, but the necessary capital for suitable rationalisation schemes was not available to every company. Only if the trend toward shorter working hours were curbed temporarily could such rationalisation be brought about, Professor Haberland added.

Silkemi

A new company 'Silkemi' will shortly be registered in Denmark. It will build and operate a plant at Silkeborg for the production of nylon 6 fibre. Cost of the plant is estimated at about DKr.20 million (about £1 million). Initial capacity will be 500 metric tons annually (equal to 50 per cent of all present Danish imports of nylon 6), and the plant will come into operation in 1960.

Of the DKr.7 million (about £350,000) issued shares, DKr.3,465,000 (about £173,250) are held by the Hamburg Phrix-Werke chemical and synthetic fibre producing concern, DKr.2 million (about £100,000) by Farbenfabriken Bayer AG, of Leverkusen, and the balance by Danish interests. The company will not be majority-controlled by German interests, as Bayer have delegated their voting rights to Danish members of the board. The Danish Government has granted credit amounting to more than DKr.7 million (about £350,000) to the company.

Equipment, amounting in value to about DKr.14 million (about £700,000), is being supplied mostly by Phrix-Werke and from Switzerland. Bayer's part in the company's operation will be the supply of raw materials and the granting of licences for patented processes. Dr. Friedrich, of Phrix-Werke has been chosen as operating head of the new company.

Knoll AG

The Ludwigshafen-on-Rhine chemical firm of Knoll AG Chemische Fabriken have announced that they are to reduce their capital from DM7,560,000 (about £630,000) to DM7,000,000 (about £583,000). This is being done for 'internal family reasons', say Knoll AG, a two-family firm. The dividend, which will be declared at the company's general meeting on 11 November is for 1957 and will be 11 per cent.

International Nickel

International Nickel Company of Canada have declared their regular quarterly dividend of 65 cents a share. The 1957 total was $3.75 after an extra year-end payment of $1.15 per share.

NEW COMPANIES

BOROPEX LTD. Cap. £100. Dealers in gutta percha, india rubber, plastics and other synthetic materials, chemical products etc. Directors: Sidney Bradley and Harry Boris (directors Borovitch (Metals) Ltd.).

PREMABERG (GREAT BRITAIN) LTD. Cap. £1,000. Manufacturers of and dealers in all types of engineered and other products for use in the engineering, petroleum, chemical and gas industries. Solicitors: Allen & Overy, 3, Finch Lane, Cornhill, EC3.

INCREASES OF CAPITAL

EVODE LTD., polish manufacturers, of Common Road, Stafford. Increased by £100,000 beyond the registered capital of £100,000.

Market Reports

GOOD CALL FOR SODA AND POTASH

LONDON The demand for industrial chemicals remains steady with interest spread over most sections of the market. Home trade call for the routine soda products and for potash chemicals has been well maintained. Inquiry for borax and boric acid, hydrogen peroxide and formaldehyde is active. Sulphate of copper is in fair request both on home account and for shipment. Prices generally display a firm undertone.

There has been a good volume of export inquiry with bookings well up to recent levels. Crude tar and pitch are moving well in a steady coal-tar products market, and both cresylic acid and phenol crystals are in good request.

MANCHESTER Quotations for heavy chemical products on the Manchester market have been well maintained throughout the range and there is little indication of an easier trend. Most industrial consumers are taking reasonably steady deliveries under contracts, although replacement buying tends to cover somewhat shorter periods than usual. Export business is on a fair scale. Moderate activity is reported in the market for fertiliser materials, with a steady trade in the tar products.

GLASGOW A review of the past week's trading on the Scottish heavy chemical market was not particularly impressive, with conditions fairly quiet. Demands, although varied, showed little alteration with quantities involved mostly against current requirements. Prices generally are firm and unchanged.

The export market continues at a reasonable level with a volume of inquiries being received.

Ambersil Prevents Fusion on Blades

Since Ambersil Formula One was introduced by Amber Oils Ltd. as a mould lubricant in the plastics industry, one of the new applications has been the prevention of fusion and build-up on the blades when cutting nylon and acetate cloths. This is reported by Porth Textiles Ltd., Rhondda, Glamorgan, who are large manufacturers of ribbons, etc., and it is now believed that the aerosol-packed silicone spray would be particularly useful to users of band knife cutters on nylon cloth.

Other applications include its use for the prevention of weld-spatter adhesion, the making of sand-resin core moulds and the lubrication of food wrapping machinery.

DIARY DATES

TUESDAY, 11 NOVEMBER

CS and SCI—Nottingham: Chemistry Dept., University, 8 p.m. 'Water repellancy' by Prof. N. K. Adam.

Inc. Plant Engineers—Manchester: Engineers' Club, Albert Sq., 7.15 p.m. 'Radioisotopes in industry' by W. G. Bushridge.

SCI with CS and RIC—Aberdeen: Marischall College, 7.30 p.m. 'Constructional details of a Petersen tower sulphuric acid plant' by J. P. A. Macdonald.

SCI, Plastics and Polymers group—London: 14, Belgrave Sq., S.W.1, 6.30 p.m. Two papers on 'Plastics and corrosion'.

THURSDAY, 13 NOVEMBER

Oil and Colour Chemists' Assoc.—Grangemouth: Leapark Hotel, 7 p.m. 'Temperature measurement' by R. Postle.

Oil and Colour Chemists' Assoc.—Middlesbrough: Cleveland Scientific and Tech. Inst. Corporation Rd., 7.30 p.m. 'Education and training of instrumentation personnel' by E. B. Jones.

SAC with RIC, Birmingham and Midlands Section—Birmingham: University, 7 p.m. 'Infra-red analysis of solid substances' by Prof. G. Duyckaerts.

RIC, Manchester and District Section—Bolton: Technical College, Manchester Rd., 7.15 p.m. 'New aspects of detergent action' by Dr. D. G. Stevenson.

FRIDAY, 14 NOVEMBER

Inst. of Physics — Manchester: College of Science and Technology, 6.45 p.m. 'Photoelastic properties of polymers' by Dr. L. R. G. Treloar.

Oil and Colour Chemists' Assoc., Manchester Section—Liverpool: Constitutional Club, Tithebarn St., 6.30 p.m. Apparatus evening.

CS with Southampton University Chem. Soc.—Southampton: Chemistry Dept., University, 5 p.m. 'Aryl silicon compounds and aromatic reactivity' by Dr. C. Eaborn.

Inc. Plant Engineers, Birmingham Branch—Coventry, Hotel Leofric, 7.30 p.m. 'Maintenance of automatic plant' by J. Ward.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On Sale 10 December

Penicillin salts of rosin diamines and therapeutic preparations containing same. Abbott Laboratories. **753 739**

Preparation of 3-pyridinols and intermediates thereof. Sadolin & Holmblad A.S. **798 320**

ACCEPTANCES

Open to public inspection 10 December

Alkylene-imine derivatives. Farbenfabriken Bayer AG. [Addition to 762 723.] **805 518**

Stabilised polymeric 2, 3-dichloro-1, 3-butadiene. Du Pont de Nemours & Co., E. I. **805 519**

Micronutrient-containing fertilisers and soil improving agents. Osterreichische Stickstoffwerke AG. **805 775**

Thio-ethers of phthalides. Dow Chemical Co. **805 520**

Substituted amides of trihaloacetic acids. Bristol Laboratories, Inc. **805 575**

Preparation of methyl alkoxy polysiloxanes. Soc. Des Usines Chimiques Rhone-Poulenc. **805 529**

Oxidation of olefines. Continental Oil Co. **805 776**

N-[β(o-chlorophenyl)-β-(hydroxy)-ethyl] isopropylamine. Lilly & Co., E. **805 576**

Disazo dyestuffs of the pyrazolone series. Farbenfabriken Bayer AG. **805 777**

Piperazine derivatives. Searle & Co., G. D. **805 778**

Production of titanium. Union Carbide Corp. **805 730**

Production of thioether glycols. Farbenfabriken Bayer AG. **805 779**

Preparation of liquid hydrocarbon mixtures with improved octane number and improved volatility for use in motor gasolines. Bataafsche Petroleum Maatschappij N.V., De. **805 530**

Polyhydrophenanthrene compounds. Reichstein, T. [Divided out of 805 603.] **805 606**

Hydrophenanthrene compounds. Reichstein, T. [Divided out of 805 603.] **805 607 & 805 608**

Steroid compounds. Merck & Co., Inc. [Divided out of 805 583.] **805 584 & 805 585**

Steroids and a process for their manufacture. Reichstein, T. [Divided out of 805 604.] **805 609**

Open to public inspection 17 December

Manufacture of uranium. Imperial Chemical Industries, Ltd., and Colbeck, E. W. **806 001**

Production of uranium. Imperial Chemical Industries, Ltd., and Whaten, T. [November 29, 1945.] **806 031**

Steroidal compounds. Schering Corp. **806 162**

Aluminium alcoholate derivatives. Hardman & Holden, Ltd., Rinse, J., Land, H. S., and Kemp, S. G. **806 113**

Organic compounds containing phosphorus and sulphur and processes for their manufacture. Ciba Ltd. **805 931**

Process for removing acidic or basic vapours from gases. Veb Farbenfabrik Wolfen. **805 853**

Cupriferous disazo dyestuffs of the benzthiazole series. Ciba Ltd. **806 050**

Manufacture of steroids. Ciba Ltd. **806 141**

Elastomers. International Latex Corp. **806 142**

Monoazo dyestuffs of the indazole-azo-resorcinal series and metal complexes thereof. Compagnie Francaise des Matieres Colorantes. **806 166**

Preparing low-density gels. Grace & Co., W. R. **806 007**

Production of polymeric materials. Courtaulds, Ltd. **805 921**

Phosphate derivatives of steroids. Merck & Co., Inc. **805 828**

L-Glutamine synthesis. International Minerals & Chemical Corp. **806 146**

Preparation of polyethylene terephthalate. Distillers Co., Ltd. **805 855**

Decomposition of sulphide minerals. Texas Gulf Sulphur Co. **805 922**

Separation of metallic halides. British Titan Products Co., Ltd. **806 052**

Phosphoric and phophoric acid derivatives. Farbenfabriken Bayer A.G. **806 148**

Preparation of urea crystals. Stamicarbon N.V. **805 942**

Filters for air or other gases. Drager, O. H. **806 150**

Manufactuure of plastics. T.I. (Group Services), Ltd. **805 897**

Steroids. Upjohn Co. **806 045**

Production of tropine derivatives. Sandoz, Ltd. **805 859**

Production of melamine. Shinetsu Kagaku Kogyo Kabushiki Kaisha. **806 153**

Photographic silver halide emulsions containing optical sensitising dyes. Kodak, Ltd. **805 945**

Preparation of sulphur hexafluoride. Du Pont de Nemours & Co., E. I. **805 860**

Preparation of sulphur oxyfluorides. Du Pont de Nemours & Co., E. I. **805 874**

Production of carbon black and apparatus therefor. Phillips Petroleum Co. **806 092**

Ceramic materials. Esso Research & Engineering Co. **805 844**

Production of thin plates of ceramic material. Staatliche Porzellan-Manufaktur Berlin, Werk Selb **806 130**

Catalysts. British Oxygen Co., Ltd. [Addition to 784 638.] **805 861**

Unsaturated ureido compounds and polymers and copolymers thereof. Rohm & Haas Co. **806 093**

Phenolic antioxidants. Goodyear Tire & Rubber Co. **806 014**

Photographic light-sensitive materials. Ilford, Ltd. **805 826**

Tertiary alcohol derivatives of 8-alkylnortropanes and the acid and quaternary ammonium salts thereof. Smith Kline & French Laboratories. **805 883**

Olefinic derivatives of 8-alkylnortropanes and the acid and quaternary ammonium salts thereof. Smith Kline & French Laboratories. **805 884**

3-Substituted-8-alkylnortropanes and the acid and quaternary ammonium salts thereof. Smith Kline & French Laboratories. **805 885**

Internal cleansing of drums. Whitehead Chemical Co. (Engineering), Ltd. **806 081**

Production of divinyldioxane-(1.4). Badische Anilin- & Soda Fabrik A.G. **805 950**

Magnesium base alloys. Magnesium Elektron, Ltd. **806 103 & 806 104**

Production of alpha-beta- dichloropionic acid esters. Badische Anilin- & Soda-Fabrik A.G. **805 951**

Polymeric materials. Du Pont de Nemours & Co., E. I. **806 095**

Method for the preparation of thermoplastic polymers. Esso Research & Engineering Co. **805 862**

Molten salt baths. UK Atomic Energy Authority. **806 016**

Hydrogenolysis of esters. Imperial Chemical industries, Ltd. **806 025**

Polymerisation of chloroprene. Monsanto Chemical Co. **805 953**

Method of producing steam by utilising waste heat. Pintsch Bamag AG. **806 017**

Process for even and level dyeing of nylon textiles. Chemstrand Corp. **806 026**

Phenthiazine derivatives and processes for their preparation. Soc. Des Usines Chimiques Rhone-Poulenc. **805 886**

Synthetic rubber adhesive. Polymer Corp. Ltd **806 027**

Apparatus for continuously carrying out chemical and physical reactions. Badische Anilin- & Soda-Fabrik AG. **806 019**

Preparation of lubricating grease compositions. Bataafsche Petroleum Maatschappij N.V., De **805 864**

Imidazoline salts and a process for the production thereof. Wander AG, Dr. A. **806 060**

Production of polymer foam. General Aniline & Film Corp. **806 159**

Preparation of diaryl-methanes by a catalytic process, and catalysts for use therein. Bataafsche Petroleum Maatschappij N.V. **805 960**

Additives for petroleum fuels for internal-combustion engines. Union Rheinische Braunkohlen Kraftstoff AG. **805 913**

Preparation of cyclopentadiene. Esso Research & Engineering Co. **805 865**

Fungicidal compositions. Upjohn Co. **805 986**

Manufacture of 2-chloropyridine. Olin Mathieson Chemical Corp. **805 915**

Derivatives of 5-dialkylamino-alkylamino-8-methylthiochromone. Farbenfabriken Bayer AG. [Addition to 789 430.] **805 870**

Production of benzene. Gelsenkirchener Bergwerks AG. **805 916**

4-Aziridino-1, 2-naphthoquinones. Farbenfabriken Bayer AG. **806 079**

Moulding powders of high strength synthetic polyamides. Du Pont De Nemours & Co., E. I. **806 088**

Production of 2, 3, 5, 6-tetrahydro-1-imidaz (1, 2-a) imidazole. Monsanto Canada, Ltd. **805 877**

Steroids and the manufacture thereof. Upjohn Co. [Divided out of 806 045.] **806 046 & 806 047**

Manufacture of 9, 11-octadecadienoic acid. Pintsch Bamag AG. **805 918**

Steroid compounds. Merck & Co., Inc. [Divided out of 805 828.] **805 829 & 805 830**

Preparation of acetylacetone. Shawinigan Chemicals Ltd. **805 888**

Phenthiazine derivative and process for its preparation. Soc. Des Usines Chimiques Rhone-Poulenc. [Divided out of 805 886.] **805 887**

New Indian Explosives Plant Opened

THE NEW plant built at Gomia by Indian Explosives Ltd. was opened on Wednesday. Representing India's first commercial explosives plant it has an annual capacity of 5,000 short tons which will eventually be increased to 7,500 tons. It is located near the coalmines of Bengal and Bihar.

The public company is owned jointly by the Indian subsidiary of ICI, who hold 80 per cent of the capital, and the Indian Government who hold the remaining 20 per cent. All the development, planning and design work was done by the ICI Nobel Division.

Opening ceremony was performed by Mr. Rajendra Prasad, President of India.

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